LN03™ Plus Emulation for QMS® Printers

1800210-001D

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1

Installation

In this chapter...

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- "About this Manual" on page 1-3
- "Installing the QMS LN03 Plus Emulation" on page 1-6
- "Deinstalling the QMS LN03 Plus Emulation" on page 1-11
- "For Further Assistance" on page 1-14

About the QMS LN03 Plus Emulation

The QMS LN03 Plus Emulation offers all of the features of an LN03 Plus laser printer, including DECTEK emulation and Digital's Tektronix 4014 emulation.

If you already have files containing LN03 Plus escape sequences, or if you have set your application to print to an LN03 Plus printer, you only need to follow the installation instructions in this chapter to begin using the emulation in your QMS printer.

Host Software Compatibility

Since LN03 Plus runs under VMS, VMS compatibility is important. The QMS VMS DECnet host software 2.*x* is compatible with version 3.*x* QMS daughterboard software.

Printer Compatibility

This LN03 emulation can be installed only on QMS printers that contain a hard disk drive (either internal or external).

About this Manual

This manual is organized as follows:

1	**Introduction**	Presents an overview of and explains how to install this emulation.
2	**Configuration**	Explains how to configure this emulation.
3	**Printer Status and Reset Commands**	Explains the request and response commands for printer status and the escape sequences for resetting the printer.
4	**Set/Reset Sequences**	Explains the escape sequences that set certain operating modes for the printer.
5	**Control Characters**	Explains the single-character control codes supported by the emulation.
6	**Page Formatting and Printing Commands**	Explains the escape sequences controlling horizontal and vertical spacing, page margins, tab stops, and absolute and relative positioning.
7	**Font Handling**	Explains how to download and select fonts.
8	**DECTEK Emulation**	Explains the escape sequences that initiate Tektronix mode.
9	**Sixel Graphics**	Explains how to use sixel graphics.
A	**QMS Customer Support**	Provides product sales and support telephone numbers and describes how to communicate with QMS through the QMS Bulletin Board, CompuServe, Internet, and Q-FAX.

B Character Sets	Shows the character sets included with this emulation.

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Typographic Conventions

The following typographic conventions are used in this manual:

`Mixed-Case Courier`	Text you type, and messages and information displayed on the screen
`Mixed-Case Italic Courier`	Variable text you type; replace the italicized word(s) with information specific to your printer or computer
UPPERCASE COURIER	Information displayed in the printer message window
lowercase bold	PostScript operators and DOS commands
lowercase italic	Variable information in text
UPPERCASE	File and utility names
↵	Press the Enter key (PC) or Return key (Macintosh)
^	Press and hold down the Ctrl key (PC)

» *Note: Notes contain tips, extra information, or important information that deserves emphasis or reiteration.*

▲ **Caution:** *Cautions present information that you need to know to avoid equipment damage, process failure, or extreme annoyance.*

LN03 Plus Escape Sequences

All supported LN03 Plus escape sequences are documented fully (not just listed) in this manual. Throughout the manual, the following conventions are used when describing the escape sequences.

<ESC>	All control characters (characters with hex values less than Hex 20).
Pn, Pn_1, Pn_2	Numeric variables in an escape sequence are expressed with ***Pn***'s. Left and right margin values are examples of numeric variables. Numeric variables have a range of 0 to 9999. If a variable outside this range is used, the printer ignores the entire escape sequence.
Ps, Ps_1, Ps_2	Selection variables in an escape sequence are expressed with ***Ps***'s. Justification on or off is an example of a selection variable.

Installing the QMS LN03 Plus Emulation

These procedures are used to install the QMS LN03 Plus Emulation to QMS printers. Since this emulation is stored on a hard disk, your printer must have either an internal or external hard disk.

The LN03 Plus Emulation Diskette

The LN03 Plus Emulation Diskette contains the following files:

- PKUNZIP.EXE
- LN03.ZIP (contains LN03.PS)
- LN03-DEL.PS

LN03.PS contains the LN03 Plus Emulation. To install the emulation, this file is sent to the printer using the installation procedures presented later in this chapter.

LN03-DEL.PS is the deinstallation file. To deinstall the emulation, this file is sent to the printer using the deinstallation procedures presented later in this chapter.

To obtain LN03.PS, PKUNZIP.EXE is used to unzip LN03.ZIP. When unzipped, LN03.PS consumes almost 1.8 MB. LN03.PS was zipped to fit on one diskette.

Unzipping the LN03 Plus Emulation File

Before you install the LN03 Plus Emulation to your printer, you must first obtain LN03.PS from LN03.ZIP. Do this as follows:

1 **Insert the LN03 Plus Emulation diskette into your PC's 3.5" disk drive**.

2 **Either in Windows or DOS, create a temporary subdirectory on your PC's hard disk and copy PKUNZIP.EXE and LN03.ZIP into the subdirectory.**

3 **In DOS, change to the temporary subdirectory.**

4 **At the DOS prompt, enter the following command to unzip LN03.ZIP.**

```
pkunzip ln03.zip↵
```

5 **Confirm that LN03.PS is now in the temporary subdirectory.**

6 **Remove the LN03 Plus Emulation diskette from your PC's disk drive, and store it in a safe place.**

Installation via a Parallel or Serial Port

This procedure is used to install the LN03 Plus Emulation to printers via a parallel or serial port. If you want to install this emulation over a network, refer to "Installation via an Ethernet Network Connection" on page 1-8.

» **Note:** *This procedure assumes that LN03.PS has been unzipped from LN03.ZIP and resides in a temporary directory on your PC's hard disk. For the unzipping procedure, refer to "Unzipping the LN03 Plus Emulation File" on page 1-6.*

1 **If your printer has an Administration/Emulations/PostScript/ Emulation Level menu, set it to Level 2.**

2 **Download the LN03 Plus Emulation to the printer.**

a With your computer at the DOS prompt and at the temporary subdirectory, enter one of the following commands as appropriate:

- For a parallel connection:

```
copy /b ln03.ps lpt#↵
```

  where # is the port number (1 to 3).

- For a serial connection:

```
copy /b ln03.ps com#↵
```

  where # is the port number (1 to 4).

3 **When the download is complete, restart the printer.**

The LN03 Plus Emulation is now listed in the Options section of the printer's start-up page, in the Administration/Emulation section of the printer's configuration menu, and on the advanced status page. On some older QMS printers, emulations are not listed on the printer's start-up page.

4 **Increase the printer's K Mem Emulation client (Administration/Memory/K Mem Emulation) by at least 1 MB or, for optimum performance, by 2 MB.**

See your printer documentation for more information on this memory client and on using your printer's configuration menu.

5 **The LN03 Plus Emulation is ready to receive data from your host. Now, you can custom configure your LN03 Plus Emulation to match your printing environment. See chapter 2 "Emulation Configuration".**

» **Note:** *You may want to erase any installation files left on your PC and then remove any temporary directories.*

Installation via an Ethernet Network Connection

This procedure is used to install the QMS LN03 Plus Emulation to printers over an Ethernet network. If you want to install the emulation via a parallel or serial port, refer to "Installation via a Parallel or Serial Port" on page 1-7.

» **Note:** *Before you begin this procedure, your printer and your PC (or UNIX workstation) must be connected to an Ethernet network running TCP/IP and have valid IP addresses.*

» **Note:** *This procedure assumes that LN03.PS has been unzipped from LN03.ZIP and resides in a temporary directory on your PC's hard disk. For the unzipping procedure, refer to "Unzipping the LN03 Plus Emulation File" on page 1-6.*

1 **If your printer has an Administration/Emulations/PostScript/Emulation Level menu, set it to Level 2.**

2 Make sure your printer is on line, and that the printer's message window reads `IDLE`.

3 If you're downloading the emulation from a UNIX workstation, copy LN03.PS from your PC to a temporary directory on your workstation.

4 Open an ftp session from your PC or workstation by typing one of the following commands:

`ftp` *`printername`*↵ (for example, ftp pctdev6↵)
`ftp` *`ipaddress`*↵ (for example, ftp 161.33.130.45↵)

5 When prompted for a user name and password, press the Enter key.

If your entries are correct, an ftp> prompt displays.

6 At the `ftp>` prompt, change to binary mode by typing

`bin`↵

7 At the `ftp>` prompt, send the emulation file to the printer's hard disk by typing

`put` *`ln03`*`.ps`↵

The printer's message window reads `1 Active Job`, and the Disk light flashes to indicate that the emulation is being downloaded to the hard disk. The `ftp>` prompt returns when the emulation has finished loading.

8 When the download is complete, at the `ftp>` prompt, end the ftp session by typing

`quit`↵

9 When the Disk light stops flashing and the printer's message window reads `Idle` for at least 30 seconds, restart the printer.

10 When the printer's message window reads `Idle` again, the LN03 Plus Emulation is ready to use.

The LN03 Plus Emulation is now listed in the Options section of the printer's start-up page, in the Administration/Emulation sec-

tion of the printer's configuration menu, and on the advanced status page. On some older QMS printers, emulations are not listed on the printer's start-up page.

11 **Increase the printer's K Mem Emulation client (Administration/Memory/K Mem Emulation) by at least 1 MB or, for optimum performance, by 2 MB.**

See your printer documentation for more information on this memory client and on using your printer's configuration menu.

12 **The LN03 Plus Emulation is ready to receive data from your host. Now, you can custom configure your LN03 Plus Emulation to match your printing environment. See chapter 2 "Emulation Configuration".**

» **Note:** *You may want to erase any installation files left on your PC (and/or workstation), and then remove any temporary directories.*

Deinstalling the QMS LN03 Plus Emulation

Deinstalling the QMS LN03 Plus Emulation is similar to installing it. As the installation file was downloaded to the printer, the deinstallation file must also be downloaded to the printer. However, because the deinstallation file is not supplied zipped as is the installation file, the deinstallation file can be downloaded from the diskette drive on your PC rather than from the hard drive.

Deinstallation via a Parallel or Serial Port

This procedure is used to deinstall the QMS LN03 Plus Emulation from printers via a parallel or serial port. If you want to deinstall this option over a network, refer to "Deinstallation via an Ethernet Network Connection" on page 1-12.

1 If your printer has an Administration/Emulations/PostScript/ Emulation Level menu, set it to Level 2.

2 Download the deinstallation software to the printer.

a If your computer is running Windows, change to DOS.

b Insert the LN03 Plus Emulation diskette into your PC's 3.5" disk drive.

c Change to that drive (for example, if the diskette is in the A drive, type `a:`↵ at the DOS prompt).

d At the DOS prompt, enter one of the following commands as appropriate:

- For a parallel connection:

  ```
  copy /b ln03-del.ps lpt#↵
  ```

  where # is the port number (1 to 3).

- For a serial connection:

  ```
  copy /b ln03-del.ps com#↵
  ```

  where # is the port number (1 to 4).

On most new QMS printers (for example: a QMS 2060, 2425, or 4060), a page is printed with a message stating that the LN03 emulation was removed.

3 Restart the printer if it doesn't automatically restart.

» **Note:** *Some QMS printers automatically restart themselves at this point.*

The LN03 Plus Emulation is now no longer listed in the Options section of the printer's start-up page, in the Administration/Emulation section of the printer's configuration menu, and on the advanced status page. On some older QMS printers, emulations are not listed on the printer's start-up page.

Deinstallation via an Ethernet Network Connection

This procedure is used to deinstall the QMS LN03 Plus Emulation from printers over an Ethernet network. If you want to deinstall the option via a parallel or serial port, refer to "Deinstallation via a Parallel or Serial Port" on page 1-11.

» **Note:** *Before you begin this procedure, your printer and your PC (or UNIX workstation) must be connected to an Ethernet network running TCP/IP and have valid IP addresses.*

1 If your computer is running Windows, change to DOS.

2 Insert the LN03 Plus Emulation diskette into your PC's 3.5" disk drive.

3 Change to that drive (for example, if the diskette is in the A drive, type a:↵ at the DOS prompt).

4 If you're downloading the deinstallation file (LN03-DEL.PS) from a UNIX workstation, copy the file from your PC to a temporary directory on your workstation.

5 **If your printer has an Administration/Emulations/PostScript/ Emulation Level menu, set it to Level 2.**

6 **Make sure your printer is on line, and that the printer's message window reads `IDLE`.**

7 **Open an ftp session from your PC or workstation by typing one of the following commands:**

`ftp` *`printername`*↵ (for example, ftp pctdev6↵)
`ftp` *`ipaddress`*↵ (for example, ftp 161.33.130.45↵)

8 **When prompted for a user name and password, press the Enter key.**

If your entries are correct, an ftp> prompt displays.

9 **At the `ftp>` prompt, change to binary mode by typing**

```
bin↵
```

10 **At the `ftp>` prompt, send the deinstallation file to the printer's hard disk by typing**

```
put ln03-del.ps↵
```

The `ftp>` prompt returns when the deinstallation file has finished loading.

On most new QMS printers (for example: a QMS 2060, 2425, or 4060), a page is printed with a message stating that the LN03 emulation was removed.

11 **At the `ftp>` prompt, end the ftp session by typing**

```
quit↵
```

12 **When the Disk light stops flashing and the printer's message window reads `Idle`, restart the printer if it doesn't automatically restart.**

» **Note:** *Some QMS printers automatically restart themselves at this point.*

The LN03 Plus Emulation is now no longer listed in the Options section of the printer's start-up page, in the Administration/Emulation section of the printer's configuration menu, and on the

advanced status page. On some older QMS printers, emulations are not listed on the printer's start-up page.

» **Note:** *If you downloaded the deinstallation file from a workstation, you may want to erase any deinstallation files left on your workstation, and then remove any temporary directories.*

For Further Assistance

For assistance with installing the QMS LN03 Plus Emulation, refer to appendix A, "QMS Customer Support," in the rear of this manual.

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2

Configuration

In this chapter...

- "Changing the Configuration" on page 2-2
- "Configuration Options" on page 2-3
- "Setting the K Mem Emulation Option" on page 2-5
- "Using configcartemulation" on page 2-6

Changing the Configuration

You can change your LN03 Plus Emulation configuration by selecting new configuration option settings through your printer's control panel, through QMS Document Option Commands (DOC), or through the PostScript **configcartemulation** operator. Refer to "Configuration Options" on page 2-3 for descriptions of the configuration options.

- **Control panel selections**

  This is the most convenient way to change configuration settings. Refer to the printer user's guide and/or setup manual for instructions on using the control panel to change configuration settings. Configuration changes made through the control panel are in effect from job-to-job unless overridden with the PostScript **configcartemulation** operator or with QMS Document Option Commands.

- **QMS Document Option Commands (DOC)**

  LN03 Plus configuration options can be selected through QMS Document Option Commands. Configuration changes made with DOC are in effect only for that job. After the print job is completed, the printer automatically resets to the default configuration. Refer to the *QMS Document Option Commands* manual for information about using DOC and complete descriptions of the commands and their parameters.

- **PostScript configcartemulation operator**

  Refer to "Using configcartemulation" on page 2-6 for information on using this PostScript operator to change emulation configuration settings. Configuration changes made through the PostScript **configcartemulation** operator are the same as making configuration changes through the printer's control panel and are in effect from job-to-job unless overridden with QMS Document Option Commands.

Configuration Options

The LN03 Plus Emulation has the following configuration options.

Product ID

Purpose	This is the emulation printer model. If your host sends a Device Attributes request to the printer, the printer responds with the Product ID.
Choices	LN03, LQP02, and LA100
Default	LN03

Autowrap

Purpose	Determines whether text that exceeds the right margin wraps to the next line.
Choices	Off and On
Default	On

Paper Size

Purpose	Specifies the paper size used at power-up or when no paper size is specified.
Choices	Letter, A4, Legal, and 11x17
Default	Letter

Paper Size Override

Purpose	Controls the paper selection. If Paper Size Override is disabled, the emulation uses the transformation point for the size of paper selected and uses the current paper size (does not change paper trays). If Paper Size Override is enabled, the transformation is the same as above, and the specified paper size is selected.
Choices	Off and On
Default	Off

X Origin Inset

Purpose	Moves the lower left corner of the image to the right from 0 to 300 dots (1 inch at a resolution of 300 dpi). Use this option to eliminate clipping of the right edge of the image on some systems.
Range	0-300
Default	75

Y Origin Inset

Purpose	Moves the lower left corner of the image downward from 0 to 300 dots (1 inch at a resolution of 300 dpi). Use this option to eliminate clipping of the top edge of the image on some systems.
Range	0-300
Default	75

Reset Override

Purpose	Determines whether the printer automatically resets to the initial power-up configuration before every print job or whether it retains the configuration from the previous print job.
Choices	Off and On
Default	Off

Orientation

Purpose	Sets the printing direction of the print media.
Choices	**Portrait**—Prints y axis parallel to the long edge of the page. **Landscape**—Prints y axis parallel to the short edge of the page.
Default	Portrait

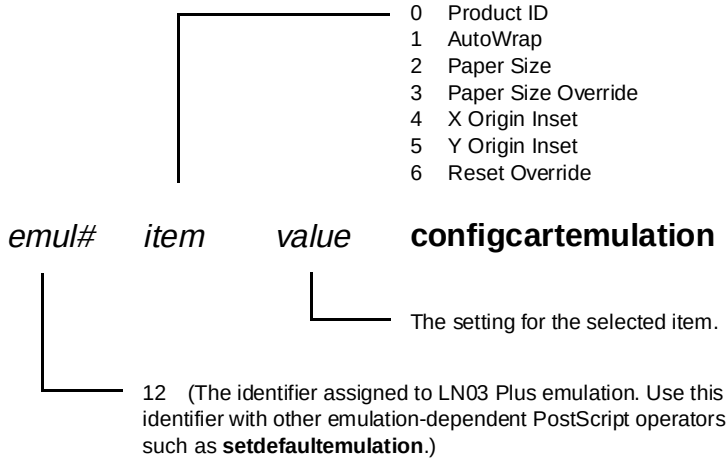
Setting the K Mem Emulation Option

The K Mem Emulation option in the Memory submenu on your printer must be set to a minimum of 660 KB for LN03 Plus to run properly.

Using configcartemulation

On QMS printers that support the **configcartemulation** operator, the LN03 Plus Emulation default values can be changed by this operator. You can include this operator in an ASCII file and send the file to the printer over any interface.

The **configcartemulation** operator takes three integers as shown in the following figure.


0 Product ID
1 AutoWrap
2 Paper Size
3 Paper Size Override
4 X Origin Inset
5 Y Origin Inset
6 Reset Override
emul#
item
value
configcartemulation
The setting for the selected item.
12 (The identifier assigned to LN03 Plus emulation. Use this identifier with other emulation-dependent PostScript operators such as setdefaultemulation.)

The emulation identifier (*emul#*) for the LN03 Plus Emulation is 12. (Other printer emulations for QMS printers have different identifiers.) The configuration selection (*item*) is the setting you want to configure. You can configure only one setting with a single **configcartemulation** operator. The selection setting (*value*) is the setting for the *item*. Depending on the selection, there may be two or more possible *values*. For example, Product ID has three possible values.

The **configcartemulation** operator must be included in an ASCII text file that accesses the PostScript language **statusdict** in the printer. The following example shows an ASCII file that uses the **configcartemulation** operator and the PostScript operators for accessing the statusdict:

```
%!
serverdict begin 0 exitserver
statusdict begin
12 0 0 configcartemulation
12 1 0 configcartemulation
end
^D
```

The last line of the file is ^D (Ctrl-D), a special command that signals the end of the file for the printer. The following tables contain the possible values for changing Product ID, Autowrap, Paper Size, Paper Size Override, X Origin Inset, Y Origin Inset, Reset Override, and Orientation. Pick the settings you want, and use the corresponding lines in your ASCII text file.

Setting Product ID

Setting	emul#	item	value	configcartemulation
LN03 Plus	12	0	0	configcartemulation
LQP02	12	0	1	configcartemulation
LA100	12	0	2	configcartemulation
Default	LN03 Plus			

Setting Autowrap

Setting	emul#	item	value	configcartemulation
Disabled	12	1	0	configcartemulation
Enabled	12	1	1	configcartemulation
Default	Enabled			

Setting Paper Size

Setting	emul#	item	value	configcartemulation
Letter	12	2	0	configcartemulation
A4	12	2	1	configcartemulation
Legal	12	2	2	configcartemulation
11x17	12	2	3	configcartemulation
Default	Letter			

Setting Paper Size Override

Setting	emul#	item	value	configcartemulation
Disabled	12	3	0	configcartemulation
Enabled	12	3	1	configcartemulation
Default	Disabled			

Setting X Origin Inset

Setting	emul#	item	value	configcartemulation
0 dots	12	4	0	configcartemulation
75 dots	12	4	75	configcartemulation
300 dots	12	4	300	configcartemulation
Range	0 to 300			
Default	75 Dots			
Notes	X Origin Inset can be set to any value from 0 to 300 dots.			

Setting Y Origin Inset

Setting	emul#	item	value	configcartemulation
0 dots	12	5	0	configcartemulation
75 dots	12	5	75	configcartemulation
300 dots	12	5	300	configcartemulation
Range	0 to 300			
Default	75 Dots			
Notes	Y Origin Inset can be set to any value from 0 to 300 dots.			

Setting Reset Override

Setting	emul#	item	value	configcartemulation
Off	12	6	0	configcartemulation
On	12	6	1	configcartemulation
Default	Off			

Setting Orientation

Setting	emul#	item	value	configcartemulation
Portrait	12	7	0	configcartemulation
Landscape	12	7	1	configcartemulation
Default	Portrait			

Substitute your choices from the above options for the similar lines in the ASCII file example shown previously. Send the ASCII file to the printer just as you would any other file to be printed.

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3

Printer Status and Reset Commands

In this chapter...

- "About Printer Status and Reset Commands" on page 3-2
- "Printer Status Commands" on page 3-2
- "Printer Reset Commands" on page 3-6

About Printer Status and Reset Commands

In LN03 Plus Emulation, your printer must be able to respond to queries from the host. The host requests device attributes from the printer. The printer responds with status reports.

▲ **Caution:** *In order to respond successfully to the host, the printer and host must be connected via the serial port. If you do not use serial communications, you may experience undesirable results if your application uses the Product Identification or Cursor Position Report sequences.*

Printer Status Commands

Product Identification (DA)

The host computer can request that the printer identify itself. The identification that the printer returns to the host depends on the control panel setting. Depending on your application and the printers it supports, you may set Product ID to the LN03 Plus printer, the LQP02 printer, or the LA100 printer. Refer to chapter 2, “Emulation Configuration” for information on how to set Product ID.

The host may request Device Attributes (DA) from the printer using either of the following sequences:

<ESC>[c

<ESC>[0c

Depending on its Product ID setting, the printer responds to the DA request with one of the following sequences:

<ESC>[?26;2c	LN03
<ESC>[?13;0c	LQP02
<ESC>[?10;3c	LA100

Device Status Request (DSR)

The host can inquire about the printer's current state by sending the Device Status Request sequence. Device Status Reports are the means of printer status communication between the host and printer. The host may send any of the following escape sequences to request various reports from the printer:

<ESC>[n	Request for extended status report.
<ESC>[0n	Request for extended status report.
<ESC>[6n	Request for cursor position report of active column and line.

The host may also command the printer to enable or disable certain types of reports by sending any of the following sequences:

<ESC>[?1n	Disable all unsolicited status reports.
<ESC>[?2n	Enable brief unsolicited status reports and send an extended status report.
<ESC>[?3n	Enable extended unsolicited status reports and send an extended status report.

The printer sends unsolicited status reports only when an error occurs. See "Device Status Reports" on page 3-4 for details of extended and brief status reports.

Device Status Reports

The printer communicates its status to the host through either brief (an error has or has not occurred) or extended (includes an error code detail) reports. The host may disable reports (see “Device Status Request (DSR)” on page 2-3“Device Status Request (DSR)” on page 3-3).

Brief reports inform the host that an error condition has been detected or that no error has been detected. If no error was detected, the brief report sequence is

<ESC>[0n

If an error was detected, the brief report sequence is

<ESC>[3n

Extended reports include the brief report but follow it with an error code(s). If no error condition exists, an extended report sequence is

<ESC>[0n<ESC>[?20n

The sequence <ESC>[0n is the brief report for No error. The sequence <ESC>[?20n contains the code (20) for No error.

If an error condition exists, the extended report has this structure:

<ESC>[3n<ESC>[?*generic code*;*specific code* ... n

» **Note:** *When unsolicited status reports are enabled, each error is reported only once per page.*

The sequence <ESC>[3n is the brief report for Error detected. The extended report contains a pair (or more) of generic and specific error codes that define the detected error(s). These codes are listed in the following table.

GENERIC CODES	
20	No error detected.
40	Character not available.
41	Line content exceeded.
42	Font file format error.
44	Font memory exceeded.
SPECIFIC CODES	
102	Lost characters or part of rule (line vector).
103	Font memory exceeded. Only complete fonts downloaded.
104	Excess fonts not loaded into memory.
112	Illegal codes in downloaded fonts.
124	Character not defined in selected font.

Cursor Position Report

When requested by the host (see “Device Status Request (DSR)” on page 2-3), the printer reports the current line and column with the following sequence:

<ESC>[*Pn*$_1$;*Pn*$_2$R

***Pn*$_1$** is the current line; ***Pn*$_2$** is the current column. The numeric values for the two positions are expressed in the current unit of measure. (The current unit of measure is either decipoints, pixels, or character cells as determined by the Position Unit Mode sequence and the Select Size Unit sequence. See chapter 4, “Set and Reset Sequences,” for more information.)

Printer Reset Commands

Reset to Initial State (RIS)

This sequence resets the LN03 Plus emulation settings to their power-up state.

Syntax: **<ESC>c**

The table below lists the settings that this sequence resets.

Soft Terminal Reset (DECSTR)

This sequence is equivalent to the RIS sequence but also exits DECTEK mode.

Syntax: **<ESC>[!p**

The table below lists the settings that this sequence resets.

Receive data	8-bit data.				
Transmit data	7-bit data & control character between hex 80 & hex FF.				
Download fonts	Not erased.				
SGR font numbers	See chapter 7, “Font Handling,” for default settings.				
Default font	Multinational 10 cpi / 10 pt.				
Page margins		LTR	A4	LEG	11X17
	Top	0"	8.1 mm	0”	0"
	Bottom	10.56"	276.4 mm	13.5”	16.5”
	Left	0"	0 mm	0”	0"
	Right	8.0"	196.3 mm	8.0”	10.56”
Tab settings	Horizontal tabs every 8 spaces. Vertical tabs every line.				
Page format	Portrait.				
Form length	LTR	A4	LEG	11X17	
	11"	287.8 mm	14"	17”	
Origin (upper left corner)	0.25" (6.4 mm) from edges of paper.				
Spacing increments		LTR	A4	LEG	11X17
	Horizontal	10 cpi	10.3 cpi	10 cpi	10 cpi
	Vertical	6.25 lpi	6.25 lpi	6.25 lpi	6.25 lpi
Active position (upper left corner)	0.25" (6.4 mm) from edges of paper.				
Font attributes	Justification off. SGR attributes off. CR / Newline mode off. LF / Newline mode off.				
Unit of measure	Character cell size.				

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4

Set/Reset Sequences

In this chapter...

- "About Set/Reset Sequences" on page 4-2
- "Set/Reset Sequences" on page 4-2

About Set/Reset Sequences

The following modes of operation may be turned on (set) or turned off (reset) with a Set/Reset sequence. Each of these modes has a unique selection parameter.

- Line Feed/New Line Mode (LNM)
- Carriage Return/New Line Mode (DECCRNLM)
- Autowrap Mode (DECAWM)
- Pitch Select Mode (DECPSM)
- Proportional Spacing Mode (DECPSP)
- Origin Placement Mode (DECOPM)
- Position Unit Mode (PUM)
- Select Size Unit (SSU)

Set and reset escape sequences have the same syntax; only the terminator differentiates between *set* or *reset*.

The syntax for a *set* sequence is

<ESC>[*Ps*h

The syntax for a *reset* sequence is

<ESC>[*Ps*l

(The terminator for a reset sequence is a lowercase L.)

Set/Reset Sequences

Line Feed/New Line Mode (LNM)

This mode controls how the printer performs a line feed in response to a line feed character. When LNM is set (on), the printer moves the current position down one line and moves the active column to the left

margin whenever it receives a line feed from the host. When LNM is reset (off), the printer moves the current position down one line but does not move the active column. The default state of LNM is reset (off).

<ESC>[20h	Set LNM
<ESC>[20l	Reset LNM

Carriage Return/New Line Mode (DECCRNLM)

This mode controls how the printer performs a carriage return in response to a carriage return character. When DECCRNLM is set (on), the printer moves the active column to the left margin and moves the current position down one line whenever it receives a carriage return from the host. When DECCRNLM is reset (off), the printer moves the active column to the left margin but does not move the current vertical position. The default state of DECCRNLM is reset (off).

<ESC>[?40h	Set DECCRNLM
<ESC>[?40l	Reset DECCRNLM

Autowrap Mode (DECAWM)

This mode controls what happens when a line of text exceeds the right margin. When DECAWM is set (on), text that exceeds the right margin automatically wraps to the next line, the active column moves to the left margin, and the current position advances to the line where the remaining text prints. When DECAWM is reset (off), text that exceeds the right margin does not print. The default state of DECAWM depends on the Autowrap configuration setting.

<ESC>[?7h	Set DECAWM
<ESC>[?7l	Reset DECAWM

Pitch Select Mode (DECPSM)

This mode controls which horizontal pitch formats text on the line. When DECPSM is set (on), the printer uses the default horizontal pitch determined by the current font. When DECPSM is reset (off), the printer uses the horizontal pitch specified by the DECSHORP sequence. (The DECSHORP sequence is discussed later in this manual.) The default state of DECPSM is reset (off).

<ESC>[?29h	Set DECPSM
<ESC>[?29l	Reset DECPSM

Proportional Spacing (DECPSP)

This mode controls the type of intercharacter spacing used: proportional or monospacing. When DECPSP is set (on), the printer uses the proportional spacing value built into the current font. (The current font must have proportional spacing in its attributes.) When DECPSP is reset (off), the printer returns to monospacing and the spacing values return to those in effect before the proportional spacing was selected. The default state of DECPSP is reset (off).

<ESC>[?27h	Set DECPSP
<ESC>[?27l	Reset DECPSP

Origin Placement Mode (DECOPM)

This mode places the origin point for the page. When DECOPM is set (on), the origin is the top left corner of the physical page. When the origin placement mode is reset (off), the origin is placed 0.25"/6.35 mm from the left edge and 0.25"/6.35 mm from the top edge of the

physical page. The default state of the DECOPM is reset (off).

<ESC>[?52h	Set DECOPM
<ESC>[?52l	Reset DECOPM

Position Unit Mode (PUM)

This mode specifies the unit of measure used with other spacing modes. When PUM is set (on), the printer uses either decipoints or pixels as the unit of measure depending on the setting of the Select Size Unit (SSU) sequence. When PUM is reset (off), the printer uses a spacing unit that is equal to one character position (character cell). A character cell's width equals the current horizontal spacing increment and its height equals the current vertical spacing increment. The default state of the PUM is reset (off).

<ESC>[11h	Set PUM
<ESC>[11l	Reset PUM

Select Size Unit (SSU)

This sequence works in conjunction with the PUM sequence to specify the unit of measurement used for spacing modes. When PUM is set (on), the SSU selects either decipoints or pixels as the unit of measurement. If the printer receives an SSU sequence while PUM is reset (off), the unit of measurement (defined by the SSU) does not take effect until PUM is set. This SSU remains in effect until another SSU is sent or the printer receives a PUM reset sequence. The default SSU is decipoints.

<ESC>[2<SP>I	Selects decipoints (1/720" or 0.35mm) as unit of measure.
<ESC>[7<SP>I	Selects pixels (1/300" or 0.85mm) as unit of measure.

To convert decipoints into pixel values, the printer uses the following formula and rounds off to the nearest integer:

Pixels = (Decipoints ÷ 5) × 12

The printer converts 1 decipoint to 0 pixels and 2 decipoints to 1 pixel.

The following table illustrates the interaction of PUM and SSU to define the unit of measure.

	SSU *Ps* = 2	**SSU *Ps* = 7**
PUM Set	Decipoints	Pixels
PUM Reset	Character cells	Character cells

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5

Control Characters

In this chapter...

- "Supported Control Characters" on page 5-2

Supported Control Characters

The following control characters are in the range Hex 00 to Hex 1F and Hex 7F to Hex 8F.

<NUL>	Hex 00	The printer ignores this control character.
<BS>	Hex 08	Backspace moves the current print position one character space to the left. Movement cannot exceed the left margin.
<HT>	Hex 09	Horizontal Tab moves the current print position to the next horizontal tab stop on the current line. Movement cannot exceed the right margin.
<LF>	Hex 0A	Line Feed moves the current print position one line down without changing the horizontal position. If LNM is set, a <LF> also moves the current position to the left margin.
<VT>	Hex 0B	Vertical Tab moves the current print position to the next vertical tab stop. Movement cannot exceed the bottom margin.
<FF>	Hex 0C	Form Feed moves the current print position to the top left margin of the next page.
<CR>	Hex 0D	Carriage Return moves the current print position to the left margin. If DECCRLNM is set, current print position also moves one line down.
<SO>	Hex 0E	Shift Out selects character set G1 for the GL table. (See chapter 7, “Font Handling.”)
<SI>	Hex 0F	Shift In selects character set G0 for the GL table. (See chapter 7, “Font Handling.”)
<DC1>	Hex 11	Device Control 1 signals the host computer that the printer is ready to receive data.
<DC3>	Hex 13	Device Control 3 signals the host computer to stop sending data until it receives a <DC1> control character from the printer.
<CAN>	Hex 18	Cancel ends any escape sequence or command in progress.

<SUB>	Hex 1A	Substitute ends any escape sequence or command in progress. During sixel graphics, <SUB> prints as a space.
<ESC>	Hex 1B	Escape begins escape sequences. If received during an escape sequence, it ends that sequence and begins a new one.
<DEL>	Hex 7F	The printer ignores this control character.
<IND>	Hex 84	Index moves the current print position one line down without changing the horizontal position. If movement exceeds the bottom margin, the current print position moves to the top margin of the next page.
<NEL>	Hex 85	Next Line moves the current print position to the left margin of the next line down. If movement exceeds the bottom margin, the current print position moves to the left margin of the next page.
<HTS>	Hex 88	Horizontal Tab Set establishes a horizontal tab stop at the current print position.
<VTS>	Hex 8A	Vertical Tab Set establishes a vertical tab stop at the current print position.
<PLD>	Hex 8B	Partial Line Down moves the current print position one-half line down. (See chapter 6, “Page Formatting and Printing Commands.”)
<PLU>	Hex 8C	Partial Line Up moves the current print position one-half line up. (See chapter 6, “Page Formatting and Printing Commands.”)
<RI>	Hex 8D	Reverse Index moves the current print position up one line. Movement cannot exceed the top margin.
<SS2>	Hex 8E	Single Shift 2 selects character set G2 for the GL table. (See chapter 7, “Font Handling.”)
<SS3>	Hex 8F	Single Shift 3 selects character set G3 for the GL table. (See chapter 7, “Font Handling.”).

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6

Page Formatting and Printing Commands

In this chapter...

- “Setting Line and Character Spacing” on page 6-2
- “Setting Page Format” on page 6-5
- “Moving Cursor/Line Position Up or Down” on page 6-11
- “Setting and Clearing Tab Stops” on page 6-12
- “Setting Text Justification” on page 6-14
- “Drawing Lines” on page 6-14

Setting Line and Character Spacing

Spacing Pitch Increment (SPI)

This sequence defines the number of *units* in a vertical or horizontal increment. The values for ***Pn*$_1$** and ***Pn*$_2$** are expressed in either decipoints or pixels depending on the setting of the SSU.

Syntax: **<ESC>[*Pn*$_1$;*Pn*$_2$<SP>G**

***Pn*$_1$**	Value of the vertical spacing increment (line height) in the unit of measure defined by SSU.
***Pn*$_2$**	Value of the horizontal spacing increment (space width) in the unit of measure defined by SSU.

***Pn*$_1$** and ***Pn*$_2$** must be integers greater than zero. If either value is zero, the printer uses the respective spacing increment built into the current font. For example, the following sequence sets the line height to 120 decipoints (6 lines per inch) and character width to the spacing of the current font:

<ESC>[120;0<SP>G

Select Vertical Line Spacing (SVS)

Use this sequence to select a specific line spacing value.

Syntax: **<ESC>[*Ps*<SP>L**

***Ps* =**	
0 (default)	6 lines per inch (lpi),1 line = 1/6"
1	4 lines per inch (lpi),1 line = 1/4"
2	3 lines per inch (lpi),1 line = 1/3"
3	12 lines per inch (lpi),1 line = 1/12"
4	8 lines per inch (lpi),1 line = 1/8"

5	6 lines per 30mm, 1 line = 5 mm
6	4 lines per 30mm, 1 line = 7.5 mm
7	3 lines per 30mm, 1 line = 10 mm
8	12 lines per 30mm, 1 line = 2.5 mm
9	2 lines per inch (lpi),1 line = 1/2"

Set Vertical Pitch (DECVERP)

Use this sequence to select a value for lines per inch.

Syntax: <ESC>[*Ps*z

***Ps* =**	
0 (default)	Line spacing determined by current font.
1	6 lpi
2	8 lpi
3	12 lpi
4	2 lpi
5	3 lpi
6	4 lpi
11	6.25 lpi (66 lines per 11" page)

Select Horizontal Character Spacing (SHS)

This sequence sets the character spacing for monospaced fonts.

Syntax: <ESC>[*Ps*<SP>K

***Ps* =**	
0 (default)	10 characters per inch (cpi), 1/10" cell width
1	12 characters per inch (cpi), 1/12" cell width
2	15 characters per inch (cpi), 1/15" cell width
3	6 characters per inch (cpi), 1/6" cell width
Note	SHS has no effect when proportional spacing is set.

Set Horizontal Pitch (DECSHORP)

This sequence sets both the character spacing (horizontal pitch) and character width of monospaced fonts. The sequence also

- sets left and right margins to the left and right edges of the printable area of the page
- sets the Line Home position to the left edge of the printable area and the Line End position to the right edge of the printable area
- resets all horizontal tab stops by multiplying their values by the new horizontal pitch then dividing by the old pitch

You may use the DECPSM (pitch select mode) sequence to switch between the horizontal pitch selected by DECSHORP and the pitch value for the current font.

Syntax: <ESC>[*Ps*w

***Ps* =**	
0 (default)	Current font value
1	10 cpi
2	12 cpi
3	13.2 cpi
4	16.5 cpi
5	5 cpi
6	6 cpi
7	6.6 cpi
8	8.25 cpi
9	15 cpi

Setting Page Format

Page Format Select (PFS)

Use this sequence to select between several standard page formats. Each PFS selection has predefined values for the following parameters:

- orientation
- margins
- form length
- line home position (active position after a carriage return)
- line end position (last possible position on a line)
- page home line (active line after a form feed)
- page end line (last possible line on a page)

Syntax: <ESC>[*Ps*<SP>J

The values for ***Ps*** and the page formats they select are given in the following table.

Ps	Page Size	Left Margin	Line Home	Right Margin	Top Margin	Page Home	Page End	Bottom Margin
0	8.5x11	0	150	2310	0	150	2842	3140
1	11x8.5	0	150	3150	0	150	1992	2290
2	8.2x11.5	0	150	2311	0	150	3042	3340
3	11.5x8.2	0	150	3301	0	150	1992	2290
4	8.5x11	0	150	2400	0	150	2842	3140
5	11x8.5	0	150	3150	0	150	2042	2340
6	8.2x11.5	0	150	2311	0	0	3290	3290
7	11.5x8.2	0	150	3301	0	0	2190	2190
?10	8.5x14	0	0	2400	0	0	4050	4050
?11	14x8.5	132	132	3918	0	0	2375	2375
?20	8.5x11	0	0	2400	0	0	3158	3158
?21	11x8.5	111	111	3016	0	0	2366	2366
?22	8.2x11.5	0	0	2321	0	97	3254	3254
?23	11.5x8.2	220	220	3126	0	0	2366	2366
?26	11x17	0	0	3168	0	0	4950	4950
?27	17x11	0	0	4950	0	0	3168	3168

Set Lines per Physical Page (DECSLPP)

Use this sequence to establish the form length of the page. The maximum form length is determined by page orientation, origin point, and paper size. The form length established by this sequence may be expressed in either pixels, decipoints, or character cells (lines) depending on the PUM and SSU sequences.

The DECSLPP sets top margin to 1 and bottom margin to the specified form length.

Syntax: **<ESC>[*Pn*t**

Pn	A numeric value greater than 0 and less than or equal to the maximum value for the current paper size. If ***Pn*** is 0, DECSLPP sets form length to the maximum value for the paper size. If ***Pn*** is greater than the maximum value for the paper, DECSLPP sets form length to the maximum value.

Set Top and Bottom Margins (DECSTBM)

This sequence sets the top and bottom margins relative to the current origin point. The top margin is the page home position. The bottom margin is the page end position. The printer cannot print text on the current page outside these margins. (It can, however, draw vectors outside the margins.)

Syntax: **<ESC>[*Pn_1*;*Pn_2*r**

Pn_1	Numeric value for top margin expressed in unit of measure determined by PUM and SSU.
Pn_2	Numeric value for bottom margin expressed in unit of measure determined by PUM and SSU.

The new margins take effect as soon as they are received by the printer with the following exceptions:

- If the value of ***Pn_1*** is omitted or set to 0, the top margin does not change.

- If the value of Pn_2 is omitted or set to 0, the bottom margin does not change.
- If the value of Pn_1 is greater than the value of Pn_2, the printer ignores the sequence.
- If the value of Pn_2 exceeds the overall form length, the bottom of the form becomes the new bottom margin.

If the current active position is above the new top margin, the active position moves to the top margin. If the current active position is below the new bottom margin, the next character printed generates a form feed.

Whenever form length changes, the printer clears the top and bottom margins, sets the top margin to 1, and sets the bottom margin to the bottom of the new form length.

If the unit of measure is decipoints, the following sequence sets both top and bottom margins to 1"/25.4 mm:

<ESC>[720;720r

Set Left and Right Margins (DECSLRM)

This sequence sets the left and right margins. The left margin is the line home position. The printer cannot print text on the current page outside these margins. (It can, however, draw vectors outside the margins.)

Syntax: **<ESC>[*Pn_1*;*Pn_2*s**

Pn_1	Numeric value for left margin expressed in unit of measure determined by PUM and SSU.
Pn_2	Numeric value for left margin expressed in unit of measure determined by PUM and SSU.

The new margins take effect as soon as they are received by the printer with the following exceptions:

- If the value of Pn_1 is omitted or set to 0, the left margin does not change.

- If the value of ***Pn*$_2$** is omitted or set to 0, the right margin does not change.
- If the value of ***Pn*$_1$** is greater than the value of ***Pn*$_2$**, the printer ignores the sequence.
- If the value of ***Pn*$_2$** exceeds the printable width of the page, the right edge of the printable area becomes the new right margin.

If the current active position is left of the new left margin, the active position moves to the left margin. If the current active position is right of the new right margin, the next character printed generates a carriage return/line feed.

If the unit of measure is decipoints, the following sequence sets a left margin of 1"/25.4 mm and a right margin of 0.5"/12.7 mm:

<ESC>[720;360s

Horizontal Position Absolute (HPA)

Use this sequence to move the current position on the current line.

Syntax: **<ESC>[*Pn*`** (` = hex 60)

Pn	A numeric value for the new position expressed in units determined by PUM and SSU settings. The value for ***Pn*** is measured from the left margin. The default value of ***Pn*** is 1.

The HPA position cannot exceed the right margin.

Horizontal Position Relative (HPR)

Use this sequence to move on the current line relative to the current position.

Syntax: **<ESC>[*Pn*a**

Pn	A numeric value, expressed in units determined by PUM and SSU settings, to add to the current position. The default value of ***Pn*** is 1.

The HPR position cannot exceed the right margin.

Horizontal Position Backward (HPB)

Use this sequence to move to the left on the current line relative to the current position.

Syntax: <ESC>[*Pn*j

Pn	A numeric value, expressed in units determined by PUM and SSU settings, to subtract from the current position. The default value of ***Pn*** is 1.

The HPB position cannot exceed the left margin.

Vertical Position Absolute (VPA)

This sequence moves the current line vertically on the page.

Syntax: <ESC>[*Pn*d

Pn	A numeric value for the new position expressed in units determined by PUM and SSU settings. The value for ***Pn*** is measured from the top margin.

The default value for ***Pn*** depends on the paper size used. The default value for LTR size paper is 1. The default value for A4 size paper is 3.

Vertical Position Relative (VPR)

This sequence moves the active line down relative to the current line without changing the horizontal position.

Syntax: <ESC>[*Pn*e

Pn	A numeric value, expressed in units determined by PUM and SSU settings, to add to the current position. The default value is 0.

If the VPR sequence moves the active position past the bottom margin, the printer sets the active position to the bottom margin and prints the page with the next character.

Vertical Position Backward (VPB)

Use this sequence to move up the page vertically relative to the current position.

Syntax: <ESC>[*Pn*k

Pn	A numeric value, expressed in units determined by PUM and SSU settings, to subtract from the current position. The default value of ***Pn*** is 0.

The VPB position cannot exceed the top margin.

Moving Cursor/Line Position Up or Down

Cursor Up (CUU)

This sequence moves the current line up a specific number of lines (cells), decipoints, or pixels depending on the current settings of PUM and SSU.

Syntax: <ESC>[*Pn*A

Pn	A numeric value for the number of units to move up from the current line.

The default value for CUU is 1. Movement cannot exceed the top margin.

Partial Line Up (PLU)

Use this sequence for superscript characters. PLU moves the current line up one-half the line spacing increment of the current font.

Syntax: **<ESC>L**

If the current line is the top margin when the PLU sequence is issued, the superscript character may print as a space. Use the Partial Line Down (PLD) sequence to return to the original current line.

Partial Line Down (PLD)

Use this sequence for subscript characters. PLD moves the current line down one-half the line spacing increment of the current font.

Syntax: **<ESC>K**

If the current line is the bottom margin when the PLD sequence is issued, the subscript character will print as a space. Use the Partial Line Up (PLU) sequence to return to the original current line.

Setting and Clearing Tab Stops

Set Horizontal Tab Stops (DECSHTS)

Use this sequence to set horizontal tabs. You may set up to 16 tabs with a single escape sequence. You may have a maximum of 32 individual horizontal tabs defined at any time.

Syntax: **<ESC>[*Pn*$_1$; ... ;*Pn*$_{16}$u**

***Pn*$_1$ ... *Pn*$_{16}$**	Up to 16 numeric values for horizontal tabs. If you set more than one tab with a single escape sequence, you must use the semicolon separators between tab values.

Tab values are expressed in pixels, decipoints, or character cells depending on the settings of PUM and SSU.

If 32 tabs have been set, the highest tab value is erased when you add the next new tab. If the new tab value is higher than any of the older 32 tabs, the printer ignores the new tab value.

Set Vertical Tab Stops (DECSVTS)

Use this sequence to set vertical tabs. You may set up to 16 tabs with a single escape sequence. You may have a maximum of 67 individual vertical tabs defined at any time.

Syntax: **<ESC>[*Pn_1*; ... ;*Pn_{16}*v**

Pn_1 ... Pn_{16}	Up to 16 numeric values for horizontal tabs. If you set more than one tab with a single escape sequence, you must use the semicolon separators between tab values.

Tab values are expressed in pixels, decipoints, or character cells depending on the settings of PUM and SSU.

If 67 tabs have been set, the highest tab value is erased when you add the next new tab. If the new tab value is higher than any of the older 67 tabs, the printer ignores the new tab value.

Tabulation Clear (TBC)

Use this sequence to delete some or all of the horizontal and vertical tabs.

Syntax: **<ESC>[*Ps*g**

***Ps* =**	
0	Clear the horizontal tab at the current position.
1	Clear the vertical tab at the current position.
2	Clear all horizontal tabs.

3	Clear all horizontal tabs.
4	Clear all vertical tabs.

Setting Text Justification

Justification

This sequence turns right-justification of text on and off.

Syntax: **<ESC>[*Ps*<SP>F**

***Ps* =**	
0	Turn off justification.
1	Turn on justification with limits.
2	Turn on justification without limits.

If ***Ps*** is 1, the printer expands the space between words to right-justify text depending on the spacing value built into the current font. The limit on expansion varies depending on the current font.

If ***Ps*** is 2, the printer can contract interword spacing to 0 or expand it as much as necessary to right justify the text.

When you select justification, the printer automatically disables autowrap mode. Any characters that exceed the right margin (depending on the current font) do not print.

Drawing Lines

Drawing Vectors

Use this sequence to draw horizontal and vertical lines.

Syntax: **<ESC>[*Ps*;*Pn*$_1$;*Pn*$_2$;*Pn*$_3$;*Pn*$_4$!|**

***Ps* = 0**	Draws a horizontal vector relative to the current X axis of the page.
***Ps* = 1**	Draws a horizontal vector relative to the current X axis of the page.
***Pn*$_1$**	Numeric value, expressed in units depending on SSU, for the starting X position of the vector. The default value of ***Pn*$_1$** is 0.
***Pn*$_2$**	Numeric value, expressed in units depending on SSU, for the starting Y position of the vector. The default value of ***Pn*$_2$** is 0.
***Pn*$_3$**	Numeric value, expressed in units depending on SSU, for the length of the vector. If ***Ps*** is 0, this value is the X length of the vector. If ***Ps*** is 1, this value is the Y length. The default value of ***Pn*$_3$** is 1.
***Pn*$_4$**	Numeric value, expressed in units depending on SSU, for the width (thickness) of the vector. If ***Ps*** is 0, this value is the X width of the vector. If ***Ps*** is 1, this value is the Y width. The default value of ***Pn*$_4$** is 1.

For example, the following sequence draws a horizontal vector, starting at coordinates (300, 300), that is 4"/101.6 mm long and 7 pixels thick (SSU is pixels):

<ESC>[0;300;300;1200;7!|

❖

7

Font Handling

In this chapter...

- "Selecting Fonts" on page 7-2
- "Selecting Character Sets" on page 7-9
- "Requesting Font Status Reports" on page 7-12

Selecting Fonts

Fonts Available

When you select QMS LN03 Plus emulation, you must have fonts (either resident on the printer or downloaded to the printer from your host computer) that are designed for LN03 Plus printers. These fonts must comply with the DEC Type 1 Variant 0 font specification. The following font files are included with the QMS LN03 Plus emulation:

Courier Medium [ASCII] LN03, 6.7 Point, 13.6 CPI
Courier Medium Supplemental LN03, 6.7 Point 13.6 CPI
Courier Medium Line Draw LN03, 6.7 Point, 13.6 CPI
DEC Tech Set LN03, 6.7 point, 13.6 CPI

Courier Medium [ASCII] LN03, 10 point, 10 CPI
Courier Medium Supplemental LN03, 10 Point 10 CPI
Courier Medium Line Draw LN03, 10 Point, 10 CPI
DEC Tech Set LN03, 10 point, 10 CPI

Courier Medium [ASCII] LN03, 10 point, 10.3 CPI
Courier Medium Supplemental LN03, 10 Point 10.3 CPI
Courier Medium Line Draw LN03, 10 Point, 10.3 CPI
DEC Tech Set LN03, 10 point, 10.3 CPI

Prestige Elite Medium [ASCII] LN03, 10 Point, 12 CPI
Prestige Elite Medium Supplemental LN03, 10 Point, 12 CPI
Prestige Elite Medium Line Draw LN03, 10 Point, 12 CPI
DEC Tech Set LN03, 10 Point, 12 CPI

Letter Gothic Medium [ASCII] LN03, 14 Point, 8 CPI
Letter Gothic Medium Supplemental LN03, 14 Point, 8 CPI

These fonts correspond to the fonts available in an LN03 Plus printer.

Downloading Fonts (DECLFF)

A *font file* contains an encoded "description" of the font and the sixel graphic data for all the characters in the font. The font download escape sequence encapsulates the font file with selection values and a comment field.

Syntax: **<ESC>P*Ps$_1$*;*Ps$_2$*;*Ps$_3$*y*Font Record Data*;*Comments*<ESC>**

Ps$_1$	This value must be 0 (indicating that the font file is in the Digital font file format) or the printer ignores the sequence.
Ps$_2$	This value determines whether a summary sheet prints. If the value is 0 (default), the summary sheet prints. If the value is 1, the sheet does not print.
Ps$_3$	This value determines which font files to delete. If ***Ps$_3$*** is 0, the printer deletes all downloaded font files before continuing. If ***Ps$_3$*** is 1, the printer deletes only the downloaded font files whose font file ID matches the ID in this download.
Font Record Data	The download font file in Digital font file format.
Comments	Any comments you want to add to the font file. The printer ignores all comments.

» **Note:** *Downloaded fonts are permanent. They are removed by a LN03 Plus delete font command.*

The Font File ID

The font record data field in the DECLFF sequence consists of a 31-byte encoded description for the character set and attributes of the download font and the encoded font data itself in sixel graphics.

The 31-byte (base 36) description consists of the items in the following table:

Type ID	Bytes 1-7	Identifies the type family. The first byte must be Q.
Spacing	Byte 8	0 = Proportional 1 = 13.6 cpi 2 = 10.3 cpi 3 = 6.8 cpi 4 thru 9 = Reserved. Do not use. A thru Z = Monospaced. (A = 1cpi, B=2 cpi, C=3 cpi, ... , Z=26 cpi)
Type Size	Bytes 9-11	Three-byte base-36 value expressed in decipoints for the character height (e.g., 02S = 100 decipoints = 10 pt character height).
Scaling	Byte 12	Scaling of fonts is not supported. Value of byte 12 must be “K”.
Type Style	Bytes 13-14	Two-byte (10 bit base 36) value describing the type style for the font. Each bit describes a different style (00 = Normal): Bit 0 = 1 = Italic Bit 1 = 1 = Slant Bit 2 = 1 = Underlined Bit 3 = 1 = Overlined Bit 4 = 1 = Strike-Through Bit 5 = 1 = Reverse Video Bits 6 - 9 are reserved (always 0)
Weight	Byte 15	4 = Ultra Light 7 = Extra Light A = Light D = Semi Light G = Regular J = Medium M = Semi Bold and Demi P = Bold S = Heavy and Extra Bold V = Black, Ultra Bold, and Ultra Heavy

Proportion	Byte 16	4 = Ultra Expanded 7 = Extra Expanded A = Expanded D = Semi Expanded G = Regular J = Medium M = Semi Condensed P = Condensed S = Extra Condensed V = Ultra Condensed
Rotation	Bytes 17-18	00 = Portrait (No rotation). Values other than 00 are landscape rotation.
Character Set	Bytes 19-21	01U = ASCII 01O = DEC Supplemental 01Q = DEC Technical 01C = VT100 Line Drawing
Character	Bytes 22-25	ZZZZ = Full character set subset.
File Encoding	Bytes 26-27	02 = Binary data.
Resolution	Byte 28	F = 300 dots per inch.
Reserved	Bytes 29-31	Set these three bytes to 000.

For example, this is the 31-byte descriptor for a Courier 10pt/10cpi ASCII character set download font:

QCOURIRJ02SK00GG0001UZZZZ02F000

QCOURIR	Type family ID.
J	Spacing (J=10cpi).
02S	Height (100 decipoints).
K	No scaling.
00	Normal style.
G	Regular weight.
G	Regular proportion.
00	Portrait orientation.

01U	ASCII character set.
ZZZZ	Full character set subset.
02	Binary encoding.
F	300 dpi resolution.
000	Reserved characters.

The sixel graphics data for the download font immediately follows byte 31. Only one character set may be downloaded to the printer at a time. You can follow the sixel graphics data with another 31-byte descriptor for another font or character set.

Deleting a Type Family or Font File (DECDTFF)

Use this sequence to delete downloaded fonts by their type family or font file ID strings.

Syntax: **<ESC>P*Ps*~*ID string*<ESC>**

***Ps* = 0**	ID string is type family ID.
***Ps* = 1**	ID string is font file ID.

The following example sequence deletes the font file Courier 10 point/ 10 cpi ASCII character set:

<ESC>P1~QCOURIRJ02SK00GG0001UZZZZ02F000<ESC>

You can also delete all downloaded fonts from memory before beginning a font download sequence by setting the DECLFF Ps_3 value to 0. You may also use the following DECLFF sequence to delete all download fonts without sending font record data:

<ESC>P0;0;0y<ESC>

Assign Type Family or Font (DECATFF)

Once you have downloaded a font, you must assign a Select Graphics Rendition (SGR) number to the font. This SGR number will be used by the SGR escape sequence to select a font for printing.

Syntax: **<ESC>P*Ps$_1$*;*Ps$_2$*;}*ID string*<ESC>**

***Ps$_1$* =**	
0	Assign SGR number in ***Ps$_2$*** to the font ID string.
1	Assign SGR number in ***Ps$_2$*** to the font ID string.
2	Assign SGR number in ***Ps$_2$*** to the type family ID string.
Ps$_2$	SGR number. (Range = 10 to 19)
ID String	If ***Ps$_1$*** is 0 or 1, this is the first 16 bytes of the 31-byte download font descriptor. If ***Ps$_1$*** is 2, this is the first 7 bytes (the type family ID) of the download font descriptor.

The following SGR numbers are automatically assigned when you turn on the printer:

10	QMS Built-In-1 Family (power-up default selection)
11	Courier Family
12	Elite Family
13	Courier 10pt, 10cpi
14	Elite 10pt, 12cpi
15	Courier 6.7pt, 13.6cpi
16	Courier 10pt, 10.3cpi
17	QMS Built-In-1 Family
18	QMS Built-In-1 Family
19	Modern Gothic 14pt

You may use DECATFF to reassign these SGR numbers to any fonts you have downloaded to the printer.

Select Graphic Rendition (SGR)

Use this sequence to select a font and any of four font attributes.

Syntax: **<ESC>[*Ps*m**

***Ps* =**	
1	Bold printing on.
22	Bold printing off.
3	Italic printing on.
23	Italic printing off.
4	Underlining on.
24	Underlining off.
9	Strike-through printing on.
29	Strike-through printing off.
10	Font selection (see DECATFF).
11	Font selection (see DECATFF).
12	Font selection (see DECATFF).
13	Font selection (see DECATFF).
14	Font selection (see DECATFF).
15	Font selection (see DECATFF).
16	Font selection (see DECATFF).
17	Font selection (see DECATFF).
18	Font selection (see DECATFF).
19	Font selection (see DECATFF).
0	Turn all attributes off.

You may select more than one font attribute with one SGR sequence but you must use a semicolon to separate the selection values.

Selecting Character Sets

Selecting Graphic Character Sets

A *character set* is a complete group of characters: alphanumeric and any special symbols (depending on the type of character set). Before printing, you must select a character set and a font. To select a character set, you must first designate it as either G0, G1, G2, or G3.

Syntax:	**<ESC>(*Ps***	**Designates G0 (default for GL)**
Syntax:	**<ESC>)*Ps***	**Designates G1**
Syntax:	**<ESC>*Ps***	**Designates G2 (default for GR)**
Syntax:	**<ESC>+*Ps***	**Designates G3**
Syntax:	**<ESC>-*Ps***	**Designates G1 (96-character sets)**
Syntax:	**<ESC>.*Ps***	**Designates G2 (96-character sets)**
Syntax:	**<ESC>/*Ps***	**Designates G3 (96-character sets)**

***Ps* =**	
B	ASCII (default for G1 and G0)
<	Supplemental (default for G2 and G3)
>	Technical
0	Line Drawing
A	United Kingdom
4	Dutch
5	Finnish
R	French
9	French Canadian
K	German
Y	Italian
J	JIS Roman
6	Norwegian/Danish

Z	Spanish
7	Swedish
=	Swiss
`	ISO Norwegian/Danish (value is hex 60)

After designating a character set as G0, G1, G2, or G3, map it to either the “graphics left” (GL) table or the “graphics right” (GR) table. The GL table corresponds to character values between Hex 00 and Hex 7F. The GR table corresponds to character values from Hex 80 to Hex FF.

<SI>	(Hex 0F) Maps G0 to GL
<SO>	(Hex 0E) Maps G1 to GL
<ESC>~	Maps G1 to GR
<ESC>n	Maps G2 to GL
<ESC>}	Maps G2 to GR
<ESC>o	Maps G3 to GL
<ESC>|	Maps G3 to GR
<ESC>N	Maps G2 to GL for one character
<ESC>O	Maps G3 to GL for one character

See appendix B, “Character Sets,” for complete information on the character sets and GL/GR tables. The following series of commands illustrate how the graphics character set selection sequences could be used:

<ESC>(B **<ESC>)B**	Designates the ASCII character set as both G0 and G1. This is the default setup for the printer.
<ESC>*<	Designates the Supplemental character set as G2. This is also the default setup for the printer.
<ESC>+5	Designates the Finnish character set as G3.

<SI>	Maps the ASCII character set (G0) to the GL table. This is the default setup for the printer.
<SO>	Maps the ASCII character set (G1) to the GR table. This is the default setup for the printer.
<ESC>}	Maps the Supplemental character set (G2) to the GR table. This is the default setup for the printer.
<ESC>|	Maps the Finnish character set (G3) to the GR table.

These designations remain in effect until you issue new designations or mappings.

Graphic Size Selection (GSS)

Use this sequence to set the character height of characters in the font selected **after** this sequence.

Syntax: **<ESC>P*Pn*<SP>C**

Pn	Numeric value, expressed in units determined by PUM and SSU, for the desired height of the characters.

The height of the characters implies the width of characters in the font. The default value of ***Pn*** is 100.

For example, the following sequence selects an 8pt font:

<ESC>P80<SP>C

If an 8pt font has not been downloaded to the printer, the next greater size font will be selected.

Graphic Size Modification (GSM)

Use this sequence to select a new character size **expressed as a percentage of the size selected by the previous GSS command** in the current font.

Syntax: **<ESC>P*Pn*$_1$;*Pn*$_2$<SP>B**

***Pn*$_1$**	Numeric value expressing character height as a percentage of the current character height.
***Pn*$_2$**	Numeric value expressing character width as a percentage of the current character width.

For example, if the character height selected as a result of the GSS command is 10pt, the following sequence selects a 6pt font:

<ESC>P60;100<SP>B

If a 6pt font has not been downloaded to the printer, the next greater size font will be selected.

Requesting Font Status Reports

Request Font Status (DECRFS)

Send this sequence to the printer to request status reports on fonts and download memory.

Syntax: **<ESC>[*Ps*"{**

***Ps* =**	
0	Request status of resident fonts, download fonts, and font memory.
1	Request status of resident and download fonts.
2	Request status of download font memory.

Font Status Report (DECFSR)

The printer uses this sequence when responding to the DECRFS sequence from the host.

Syntax: **<ESC>P*Ps*"{*ID string*<ESC>**

***Ps* =**	
1	Font status.
2	Download memory status.
ID String	If ***Ps*** is 1, this is the font status report. If ***Ps*** is 2, this is the number of bytes of download memory available in the printer.

The following sequence is an example of a font status report format:

```
<ESC>P1"{font ID(font family ID):<CR>
<SP><SP><ESC>font file ID,<CR><LF>
<SP><SP>font file ID,<CR><LF>
<SP><SP>font file ID,<CR><LF>
...
...
<SP><SP>font file ID;<CR><LF>
<ESC>\
```

❖

8

DECTEK Emulation

In this chapter...

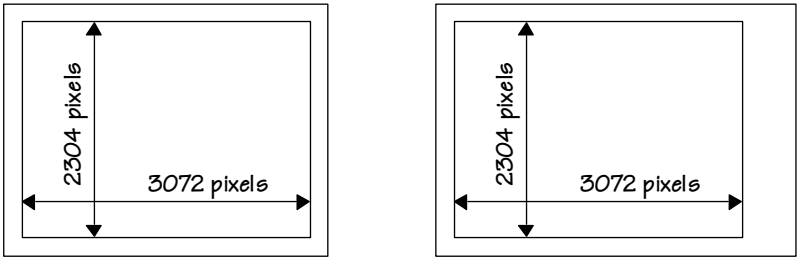
- "Using the DECTEK Emulation" on page 8-2
- "DECTEK Fonts" on page 8-4
- "DECTEK Control Characters and Escape Sequences" on page 8-4
- "DECTEK Modes" on page 8-6

Using the DECTEK Emulation

Your QMS printer emulates the Tektronix 4010/4014 mode (DECTEK) of the DEC LN03 Plus printer. In DECTEK, the printer processes text or graphics data (vectors or plot data) as would a DEC LN03 Plus printer.

You can use DECTEK to mix ANSI text with Tektronix graphics on the same page as long as DECTEK occurs before any ANSI text has been printed on the page.

When in DECTEK emulation, the printer plots data within a “Tekpage” that is 3072 pixels wide by 2304 pixels and always in landscape orientation (see the following figure). The Tekpage always keeps these dimensions regardless of the physical page dimensions. The Tekpage is slightly smaller than letter-size paper. If you use A4-size paper, the Tekpage leaves a large right margin.



Letter Size Page A4 Size Page

DECTEK emulation has five individual modes: Alpha Mode, Graph Mode, Point Plot Mode, Incremental Plot Mode, and Bypass Mode (See “DECTEK Modes” on page 8-6).

Entering DECTEK Emulation

To enter DECTEK emulation, use the following escape sequence:

<ESC>[?38h

The printer makes these preparations for Tektronix emulation after receiving the DECTEK sequence:

- If the printer's page buffer contains any data, the printer performs a form feed. If the buffer is empty, the printer does not perform a form feed.
- The printer saves the current state of ANSI mode (non-DECTEK mode). The printer will restore this state after exiting DECTEK emulation.
- The printer establishes the DECTEK mode “page” and selects DECTEK fonts.
- The printer resets to their defaults any DECTEK modes that may have been previously changed.

Exiting DECTEK Emulation

To leave DECTEK emulation, use one of the following escape sequences:

<ESC>[?38l

<ESC>[!p Soft Terminal Reset (DECSTR)

The DECSTR command also resets the printer to its power-up state. For more information, see DECSTR, in chapter 3, “Printer Status and Reset Commands.” Do not use the RIS (Reset to Initial State) escape sequence (<ESC>c) to exit DECTEK emulation. During DECTEK emulation, the printer interprets the RIS escape sequence as a valid DECTEK command.

DECTEK Fonts

The DECTEK emulation on your printer includes these two resident DECTEK fonts:

DMDRGTH	14pt Modern Gothic
DCOURIR	6.7pt Courier

For more information about these fonts, see “Alpha Mode” on page 8-6.

DECTEK Control Characters and Escape Sequences

In addition to the escape sequences in this list, several DECTEK modes have their own escape sequences. For more information, see “DECTEK Modes” on page 8-6.

<BEL>	Clears Bypass Mode.
<BS> (Back Space)	Backspaces the current position one character to the left. The backspace cannot move the current position past the left margin. If the current position moves onto an existing Alpha Mode character, the next character overprints the existing one.
<HT> (Horizontal Tab)	Moves the current position one character to the right. If the current position is at the right margin, the horizontal tab moves the current position to the left margin of the next line.

<LF> (Line Feed)	Moves the current position to the next line without changing the horizontal position. If the current position is at the bottom margin, line feed moves the current position to the top of the Tekpage and switches margins. Line feed also clears Bypass Mode.
<VT> (Vertical Tab)	Moves the current position up one line without changing the horizontal position. The current position cannot move beyond the top margin.
<CR> (Carriage Return)	Moves the current position to the current left margin (Margin-1 or Margin-2) and clears Bypass Mode if Alpha Mode is active. If Graph Mode is active, a carriage return enables Alpha Mode and moves the current position to Margin-1 (horizontally) and the closest printable position relative to the graphics cursor (vertically). If Incremental Plot Mode is active, a carriage return enables Alpha Mode and moves the current position horizontally to the nearest left margin (Margin-1 or Margin-2) and vertically to the current character cursor position. A carriage return also changes Graph Mode vector pattern and width to the default settings unless transparent vectors have been specified (see <ESC><FF> for transparent vectors).
<ESC>	Begins an escape sequence. If the Escape character occurs in an escape sequence, the printer ignores the first escape sequence and begins a new one.
<FS>	Switches from Alpha Mode or Graph Mode to Point Plot Mode, and resets vector pattern and width to the default settings unless transparent vectors have been specified (see <ESC><FF> for transparent vectors).
<GS>	Switches from Alpha Mode to Graph Mode.
<RS>	Switches to Incremental Plot Mode from any mode.

<US>	Switches to Alpha Mode from any mode and clears Bypass Mode.
<ESC><BEL>	Same as <BEL>.
<ESC><BS>	Same as <BS>.
<ESC><HT>	Same as <HT>.
<ESC><LF>	Embeds a line feed in the file when followed by a “no-op” code, such as <ACK>.
<ESC><CR>	Embeds a carriage return in the file when followed by a “no-op” code such as <ACK>.
<ESC><VT>	Same as <VT>.
<ESC><FF>	Switches to Alpha Mode from any mode, moves the current position to the home position of the Tekpage and sets the current left margin to Margin-1, clears EGM, ejects the current page, and clears Bypass Mode. Also resets vector pattern and width (including transparent vectors) to the default settings.
<ESC><FS>	Same as <FS>.
<ESC><GS>	Same as <GS>.
<ESC><RS>	Same as <RS>.
<ESC><CAN>	Switches to Bypass Mode.
<ESC><SUB>	Switches to Alpha Mode from any mode.
<ESC><US>	Same as <US>.

DECTEK Modes

Alpha Mode

The DECTEK Alpha Mode is the default mode. Whenever the printer receives the DECTEK escape sequence, it enables Alpha Mode. You may enter Alpha Mode from any of the other modes by using any one of these commands:

- <CR>
- <US>
- <ESC><FF>
- <ESC><US>
- <ESC><SUB>

In Alpha Mode, you may select from four character sizes:

<ESC>8	Large character size, Modern Gothic typeface
<ESC>9	Medium large character size, Modern Gothic typeface
<ESC>:	Medium small character size, Courier typeface
<ESC>;	Small character size, Courier typeface

You may use the DECLFF command to download different typefaces to use instead of the default Alpha Mode faces. The fonts you download must use the identical font descriptor as the resident Alpha Mode fonts. For the two large character sizes (<ESC>8 and <ESC>9), use

QMDRGTHH03WK00GG0001UZZZZ02F000 (ASCII character set)
QMDRGTHH03WK00GG0001OZZZZ02F000 (Supp. character set)

For the two smaller character sizes (<ESC>: and <ESC>;), use

QCOURIR101VK00GG0001UZZZZ02F000 (ASCII character set)
QCOURIR101VK00GG0001OZZZZ02F000 (Supp. character set)

You may print in Alpha Mode in either one column (full page width) or two columns in the Tekpage. Printing extends to full width if text exceeds the middle of the Tekpage before you issue a <CR><LF> to end each line. Printing is in two columns if you issue a <CR><LF> to end each line before text reaches the middle of the Tekpage.

If you are printing full width, you must issue an <ESC><FF> at the end of the last text line on the page before automatic wrapping moves the current print position to column 2 at the top of the same page. The <ESC><FF> continues full width printing to the next page.

If you are printing in two columns, a <CR><LF> at the bottom of column 1 moves the current print position to the left margin of column 2 (an imaginary line in the middle of the Tekpage) at the top line. To continue two column printing on the next page, you must issue an <ESC><FF> in the last line of text in column 2 before the text automatically wraps back to column 1.

Graph Mode

DECTEK Graph Mode is the vector plotting mode. You can enter Graph Mode from Alpha Mode (only) by issuing the <GS> or <ESC><FS> command.

In Graph Mode, the first byte that the printer receives after the <GS> defines the starting point of the vector. The second and successive bytes define the endpoints of the vectors. For example, the following sequence plots vectors to points B, C, and D beginning at point A.

```
<GS>ABCD
<GS>AB<GS>CD
```

You may select from a variety of vector styles using any of the following escape sequences after the <GS> command:

<ESC>`	Normal intensity, solid vectors (` = hex 60)
<ESC>a	Normal intensity, dotted vectors
<ESC>b	Normal intensity, dot-dash vectors
<ESC>c	Normal intensity, short dash vectors
<ESC>d	Normal intensity, long dash vectors
<ESC>e	Normal intensity, solid vectors
<ESC>f	Normal intensity, solid vectors
<ESC>g	Normal intensity, solid vectors
<ESC>h	Bold, solid vectors
<ESC>i	Bold, dotted vectors
<ESC>j	Bold, dot-dash vectors
<ESC>k	Bold, short dash vectors

<ESC>l	Bold, long dash vectors
<ESC>m	Bold, solid vectors
<ESC>n	Bold, solid vectors
<ESC>o	Bold, solid vectors
<ESC>p	Transparent, solid vectors
<ESC>q	Transparent dotted vectors
<ESC>r	Transparent dot-dash vectors
<ESC>s	Transparent short dash vectors
<ESC>t	Transparent long dash vectors
<ESC>u	Transparent, solid vectors
<ESC>v	Transparent, solid vectors
<ESC>w	Transparent, solid vectors

Point Plot Mode

In Point Plot Mode, only the ending points of vectors are plotted. Vectors are not plotted. Addressing of points is the same as in Graph Mode.

You enter Point Plot Mode from either Graph Mode or Alpha Mode by sending the <FS> or <ESC><FS> command.

Incremental Plot Mode

In Incremental Plot Mode, the printer plots points relative to the character cursor position. You enter Incremental Plot Mode from any other mode by sending either the <RS> or <ESC><RS> command.

Incremental Plot Mode uses the following characters to move the character cursor position (“pen”) and plot points:

<SP>	Pen Up
P	Pen Down
D	Up (north)

E	Up right (northeast)
A	Right (east)
I	Down right (southeast)
H	Down (south)
J	Down left (southwest)
B	Left (west)
F	Up left (northwest)

All characters in Incremental Plot Mode must be uppercase.

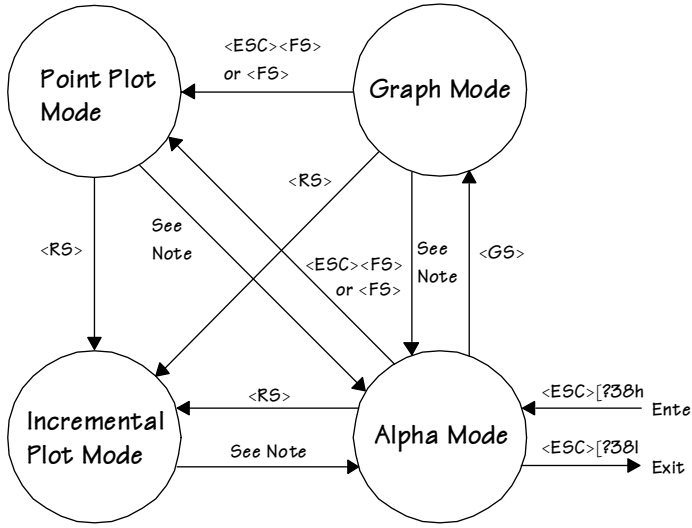
Bypass Mode

In Bypass Mode, the printer receives data but does not print or change the current position. You enter Bypass Mode from any other mode by sending the <ESC><CAN> command. To exit Bypass Mode, use any one of the following commands:

<ESC><CR>
<ESC><LF>
<ESC><FF>
<ESC><US>
<BEL>
<CR>
<LF>
<US>
<BEL>

Switching Modes

The following figure illustrates the commands you can use to switch modes in DECTEK emulation.



Note: Use <US>, <CR>, <ESC>< FF>, <ESC><US>, or <ESC><SUB>.

Vector Coordinate Encoding

In Graph Mode, vectors are plotted on the Tekpage whose coordinates are expressed in “Tekpoints” (3 pixels per Tekpoint in normal Graph Mode or 0.75 pixels per Tekpoint via the Enhanced Graphics Module feature). The dimensions of the Tekpage are 1024 Tekpoints by 768 Tekpoints in normal Graph Mode or 4096 Tekpoints by 3072 Tekpoints with EGM.

To plot the Tekpoints, the Tekpage is divided into a 32 X 32 unit imaginary grid. Each “cell” of this matrix can be assigned a coordinate pair (called HI-X and HI-Y). Each cell is subdivided into its own 32 X 32 units. Each unit of this subdivided matrix can also be assigned a coordinate pair (called LO-X and LO-Y).

The HI-X and HI-Y values are assigned the characters from <SP> (hex 20) to ? (hex 3F). The LO-X values are assigned the characters from @ (hex 40) to - (hex 5F). The LO-Y values are assigned the characters from \ (hex 5C) to <DEL> (hex 7F). By using the characters in these ranges, the start and end Tekpoints for vectors can be expressed in 10-bit encoding (normal mode). The following table illustrates the format and order of bytes for defining addresses. (The EGM mode uses the Extra Byte to achieve 12-bit encoding for higher definition plotting.)

7-BIT ASCII CHARACTER							
	Tag Bits		Address Bits				
Byte Name	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Hi-Y	0	1	5 MSBs of Y address				
Extra Byte	1	1	*	Y2	Y1	X2	X1
Lo-Y	1	1	5 inter. bits of Y address				
Hi-X	1	1	5 MSBs of X address				
Lo-X	1	1	5 inter. bits of X address				

The eighth bit of each character is always discarded. The printer must receive the characters in this order: HI-Y, LO-Y, HI-X, LO-X.

For example, assume that the following characters were received:

) 00101001

l 01101100

, 00101100

P 01010000

The eighth bit of each character is discarded. Bits 7 and 6 of each character are interpreted according to table 7.1 and stripped from the remaining bits. The remaining bits of the HI-X character are paired with the remaining bits of the LO-X character as follows:

0110010000 = 400 (decimal) = X coordinate

The remaining bits of the HI-Y character are paired with the remaining bits of the LO-Y character as follows:

0100101100 = 300 (decimal) = Y coordinate

The resulting X,Y pair (400,300) is expressed in Tekpoints, converted to pixels by the printer, and plotted on the Tekpage.

In Enhanced Graphics Mode (EGM), the Extra Byte further divides the (LO-X,LO-Y) unit into a 4 X 4 unit grid. Processing of the five characters is similar to 10-bit addressing. However, the order of characters received must be: HI-Y, EB (Extra Byte), LO-Y, HI-X, LO-X. Bit 5 of the EB is discarded. Bits 4 and 3 of the EB are added to the 10-bit Y address. Bits 2 and 1 are added to the 10-bit X address. If the EB is 01100000, then (using the previous examples) the resulting 12-bit addresses would be:

011001000000 = 1600 (decimal) = X coordinate

010010110000 = 1200 (decimal) = Y coordinate

The resulting X,Y pair (1600,1200) is expressed in Tekpoints, converted to pixels by the printer, and plotted on the Tekpage.

Shortened Address Transmission

If only a portion of an address changes, only certain bytes must be sent, as shown in the following table.

SHORTENED ADDRESS TRANSMISSION RULES					
If these change:	**These bytes must be sent:**				
	Hi-Y	**Lo-Y**	**Hi-X**	**Lo-X**	**EB**
Hi-Y	Yes			Yes	
Lo-Y		Yes		Yes	
Hi-X		Yes	Yes	Yes	
Lo-X				**Yes**	
Extra Byte					**Yes**

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9

Sixel Graphics

In this chapter...

- “About Sixel Graphics” on page 9-2
- “Sixel Graphics Controls” on page 9-2
- “Sixel Graphics Data” on page 9-6

About Sixel Graphics

The sixel graphics feature of LN03 Plus emulation enables the printer to print pictures and to mix them with text data on the page. Sixels are vertical lines of six pixels. To most printers, a pixel is equal to one dot. On your QMS laser printer, one dot is 1/300" wide. With sixel graphics, printing a picture requires less data (depending on the size of the sixels) transmitted from the host.

Sixel Graphics Controls

Selecting Sixel Graphics Mode

Use this escape sequence to initiate sixel graphics mode:

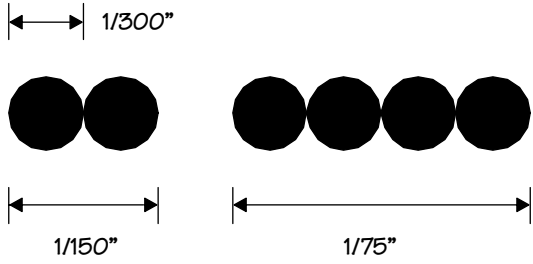
Syntax: **<ESC>P*Ps$_1$*;*Ps$_2$*;*Pn$_1$*q"*Pn$_2$*;*Pn$_3$*;*Pn$_4$*;*Pn$_5$*<*picture data*><ESC>**

Ps$_1$	Value from the following table that selects a horizontal grid size (HGS). The HGS defines the width of the pixel in dots.
Ps$_2$	Background color. Since your printer is a monochrome device, it ignores this value.
Pn$_1$	Numeric value that, if not zero, overrides the HGS selection in ***Ps$_1$***. Expressed in units of measurement defined by the SSU selection.
q	Indicates the start of the sixel graphics data stream.
"	Defines the pixel aspect ratio.
Pn$_2$	Vertical size portion of the aspect ratio.
Pn$_3$	Horizontal size portion of the aspect ratio. Does not affect HGS.
Pn$_4$	Height of the picture data. The printer ignores this value.

Pn_5	Width of the picture data. The printer ignores this value.
picture data	Generated by the graphics software application.
<ESC>	Terminator. Restores text mode.

Selecting the Horizontal Grid Size (HGS)

The HGS defines the spacing between pixels. For example, if the HGS is 1/150", each pixel is 2 dots wide. If HGS is 1/75”, each pixel is 4 dots wide.



You select the HGS with the ***Ps_1*** value (see the table below) in the sixel mode sequence. As pixels become wider, less data is required for your picture but the sharpness of the picture decreases.

HGS			ASPECT RATIO	VGS	
Ps_1	Inches	Inches	vert:horiz	Inches	Inches
0	0.0067	1/150	200:100	0.0133	1/75
1	0.0067	1/150	200:100	0.0133	1/75
2	0.0030	1/337.5	450:100	0.0133	1/75
3	0.0044	1/225	300:100	0.0133	1/75
4	0.0053	1/187.5	250:100	0.0133	1/75
5	0.0067	1/150	200:100	0.0133	1/75
6	0.0089	1/112.5	150:100	0.0133	1/75
7	0.0103	1/97.5	130:100	0.0133	1/75
8	0.0119	1/84	112:100	0.0133	1/75
9	0.0133	1/75	100:100	0.0133	1/75

If the HGS you want is not in the above table, you may use the Pn_1 parameter to define a specific HGS. The value of Pn_1 may be any non-zero number and is expressed in either decipoints (1/720") or dots (1/300") depending on the setting of the SSU. For example, the following portion of a sixel graphics mode command selects an HGS of 1/150" (Ps_1) but overrides it with a Pn_1 value of 4 (4 dots or 1/75"). (The example assumes that SSU is dots.)

<ESC>P0;0;4.....

Selecting the Aspect Ratio

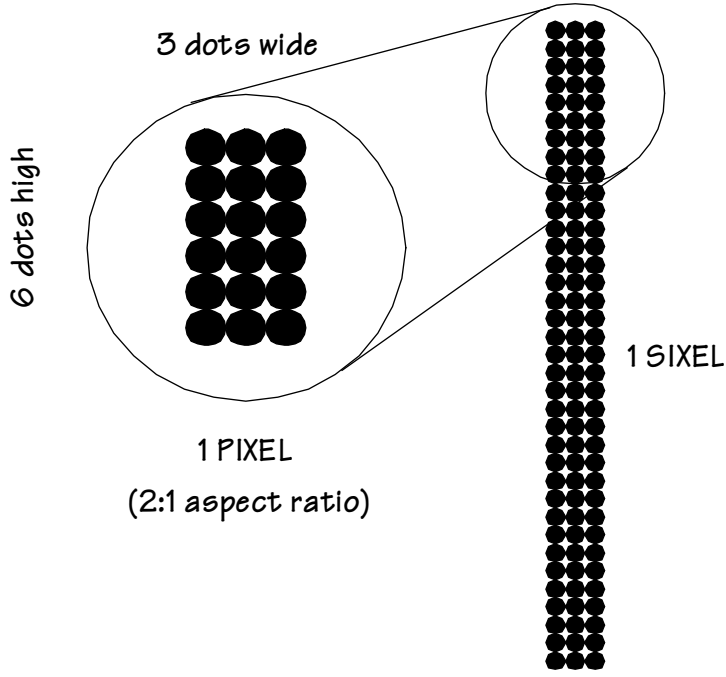
The aspect ratio defines the shape of the pixel. The value of Pn_2 and Pn_3 may be any non-zero decimal integer. Any other character in either of these parameters terminates the ratio value.

ASPECT RATIO = VERTICAL SIZE (DOTS) / HORIZONTAL SIZE (DOTS) = *Pn2* / *Pn3*

The following portion of a sixel graphics mode command defines a pixel that is 3 dots wide with an aspect ratio of 2:1:

<ESC>P0;0;3q"2;1.....

The following figure illustrates the pixel described by the above command.



Exiting Sixel Graphics Mode

When the printer processes the string terminator (<ESC>\), it exits sixel graphics mode and establishes a new current position at the graphics left margin 70 decipoints below the current sixel graphics line.

Sixel Graphics Data

About Sixel Graphics Data

The “picture data” in the sixel mode command is the sixel graphics data. Sixel graphics data is encoded in 8-bit bytes, each byte being an ASCII character code between Hex 3F and Hex 7E. If a bit has a 1 value, the printer prints the pixel. If the bit is 0, no pixel prints. The following characters have special meanings in sixel graphics data.

<CAN>	Abort sixel graphics data mode.
<SUB>	Prints a blank sixel.
<ESC>	Exits sixel graphics data mode and begins a new escape sequence.
!	Graphics Repeat Introducer (DECGRI). Precedes a decimal integer repeat value for the next sixel. If the integer is omitted or 0, the repeat value is 1. The maximum repeat value is 32767.
“	Graphics Raster Attributes (DECGRA). Introduces the pixel aspect ratio.
$	Graphics Carriage Return (DECGCR). Use this character to overprint a sixel graphics line. Returns the current position to the graphics left margin.
-	Graphics New Line (DECGNL). Returns the current position to the graphics left margin and down one sixel graphics line.

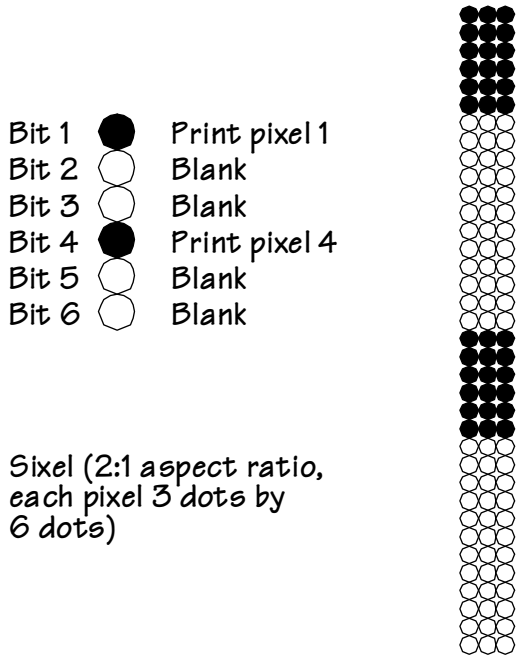
Any character greater than Hex 7F exits sixel graphics data mode. The following characters are reserved for future use:

<SP>	%	&	'	(
)	*	+	,	.
/	:	<	=	>

Decoding Sixel Graphics Data

Before transmitting data to the printer, the host computer adds an "offset value" of Octal 77 to each byte. When the printer receives each byte it subtracts this offset and discards the eighth bit. The six least significant of the remaining bits determine which pixels of the sixel print.

For example, when it receives the byte 01001000, the printer subtracts octal 77 from the byte which results in 00001001. Then it discards the eighth bit which results in 0001001. The printer prints the pixels according to the six least significant bits.



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A

QMS Customer Support

In This Appendix . . .

- Sources of customer support on page A-2
- QMS world-wide offices on page A-5

Sources of Support

Several sources of help and information are available, depending on the type of help you need:

Your QMS Vendor

Your local vendor (the one from whom you bought the printer) may be best equipped to help you. Your vendor has specially trained service technicians available to answer questions, and the equipment to analyze your printer problems.

Your Application Vendor

Often, “printing” problems have more to do with the application being used than with the printer. In this case, the application manufacturer is the best source of help.

Q-FAX

Q-FAX, a QMS information retrieval service, provides application notes, technical support notes on common printing problems, and information about printer specifications, options, accessories, consumables, and prices.

In the United States and Canada, call (800) 633-7213 to reach Q-FAX. In all other countries, call (334) 633-3850. Have your fax number handy when you call (or place the call from your fax machine's handset).

You can choose to have either a directory (a list of currently available documents) or a specific document sent to you. The first time you call, request the directory (press 2 on your phone or fax keypad when prompted). Then call back to request specific documents. You can order up to three documents per call.

The QMS Corporate Bulletin Board System

The QMS Corporate Bulletin Board System (BBS) contains technical support notes, application notes, drivers, patches, and utilities, and you may leave technical questions not requiring an immediate response on electronic mail for the Sysop (System Operator).

The bulletin board [(334) 633-3632] operates at 1200, 2400, 9600, and 14400 baud, 8 data bits, no parity, 1 stop bit, with XMODEM, YMODEM, and ZMODEM capabilities. Contact the QMS Customer Response Center (CRC) for more information about the bulletin board.

CompuServe

Through CompuServe, you ask general (non-technical) questions, share information with other users, and access printing information and programs. When you use CompuServe, type `go qmsprint↵` to go directly to the forum where QMS is located. The QMS library section contains application notes, printer drivers, utilities, technical information, and announcement files.

Internet

The QMS server provides access to technical reports, new product announcements, a trade show schedule, and other general information about QMS.

If you have access to the World Wide Web, you can view the QMS home page at http://www.qms.com/. The QMS ftp resource is ftp.qms.com.

QMS Customer Response Center (CRC)

You can contact the QMS Customer Response Center (CRC) in three different ways:

- **Telephone**—You can call the CRC at (334) 633-4500 (US) Monday–Friday, 7:00 am–6:00 pm, Central Time.

» **Note:** *If you call for assistance, have the following information ready so our technicians can help you more quickly:*

  - ☑ Your phone number, fax number, and shipping address
  - ☑ A description of the problem
  - ☑ The printer model
  - ☑ The type of host computer you're using
  - ☑ The type and version of operating system you're using
  - ☑ The interface you're using, and, if serial, the protocol (for example, XON/XOFF)
  - ☑ The application and version you're using
  - ☑ The emulation you're using
  - ☑ Your printer firmware version (listed on the status/start-up pages)

- **Fax**—You can fax questions to the CRC at (334) 633-3716 (US). Provide the same information as listed above, and indicate whether you would like a faxed or a phoned reply.
- **Internet**—If you have access to the World Wide Web, you can access the CRC through the QMS home page at http://www.qms.com/

QMS World-wide Offices

QMS United States and Latin America

General Contact
1 (334) 633-4300
Fax 1 (334) 633-4866
Email info@qms.com

Customer Response Center (CRC)
Technical Assistance
1 (334) 633-4500 7:00 am–6:00 pm Central Time
Bulletin Board Service
1 (334) 633-3632

Latin America Fax
1 (334) 639-3347

National Service
Service Information, Installation, and Maintenance Pricing
1 (800) 762-8894
On-Site Service and Depot Repair Information
1 (800) 858-1597 7:00 am–7:00 pm Central Time
Spare Parts Ordering and Information
1 (334) 633-4300 x2530 8:00 am–5:00 pm Central Time

QMS Canada

General Contact
1 (514) 333-5940
Fax 1 (514) 333-5949
Supplies and Accessories 1 (800) 268-0343 x223

National Service
On-Site Service and Depot Repair Information
1 (800) 268-4969 8:30 am–7:00 pm Eastern Time
Spare Parts Ordering and Information
1 (905) 206-9234 x238 8:30 am–5:00 pm Eastern Time

Bulletin Board Service
1 (905) 206-0084

QMS in Japan

General Contact
(+81)- 3 3779-9600
Fax (+81)-3 3779-9650

QMS in Latin America

General Contact
Cra 43 DD#8-42
Officina 201
Medellin, Colombia
(+57) (4) 312 13 70
Fax (+57) (4) 268 92 97

QMS EMEA

QMS Australia	30, Atchison Street St. Leonards NSW 2065 Australia (+61) 2–9901 3235 Fax (+61) 2–9901 3273
QMS Benelux **Belgium, Netherlands, and all unlisted countries**	Planetenbaan 60 'Corner Plaza' 3606 AK Maarssen The Netherlands (+31) 346–551333 Fax (+31) 346–550170 Internet http://www.qms.nl
QMS France	Vélizy Plus 1 Bis, Rue du Petit Clamart 78142 Vélizy Cedex France (+33) 1–410 79 393 Fax (+33) 1–408 30 110
QMS GMBH **Germany and Austria**	Willstätterstrasse 10 40549 Düsseldorf Germany (+49) 211–596 1333 Fax (+49) 211–596 1397
QMS Italy	Via della Repubblica 56 43100 Parma Italy (+39) 52–1231 998 Fax (+39) 52–1232 902

QMS Nordic **Sweden, Finland, Norway, and Denmark**	Arenavägen 41, 6th floor 121 77 Johanneshov Sweden (+46) 8–600 01 30 Fax (+46) 8–600 01 33
QMS South Africa	Saskay House Unit 24 Sunninghill Business Park Peltier Road, Sunninghill, Johannesburg Republic of South Africa (+27) 11–807 6957 Fax (+27) 11–807 6960
QMS UK **United Kingdom and Ireland**	Old Bridge House, The Hythe Staines, Middlesex TW18 3JF United Kingdom (+44) 1784–442255 Fax (+44) 1784–461641

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B

Character Sets

In This Appendix . . .

- Character Sets
- Selecting Character Sets
- Using GL and GR tables
- GL and GR Tables

Character Sets

A character set is a group of characters (usually alphanumeric and an assortment of special characters and symbols) with assigned hexadecimal values in the range hex 21 to hex FE. Your QMS printer includes these character sets for LN03 Plus emulation:

- ASCII
- Supplemental
- Technical
- Line Draw
- United Kingdom
- Dutch
- Finnish
- French
- French Canadian
- German
- Italian
- JIS (Japan Industrial Standards) Roman
- Norwegian/Danish
- Spanish
- Swedish
- Swiss
- ISO Norwegian/Danish

The contents of these character sets are listed in the tables at the end of this appendix. See “GL and GR Tables” on page 6.

Selecting Character Sets

You may "activate" up to four character sets at a time. These four active character sets (referred to as G0, G1, G2, and G3) may then be called into action quickly by using special escape sequences.

The following escape sequences designate the character sets to the four active positions. In these escape sequences, you supply the identifying value for the character set you want. These values are:

B	ASCII
<	Supplemental
>	Technical
0	LineDraw
A	United Kingdom
4	Dutch
5	Finnish
R	French
9	French Candian
K	German
Y	Italian
J	JIS Roman
6	Norwegian/Danish
Z	Spanish
7	Swedish
=	Swiss
`	ISO Norwegian/Danish (value is hex 60)

Substitute any of the above values for *Ps* in the following escape sequences:

<ESC>(*Ps*	Activate character set as G0
<ESC>)*Ps*	Activate character set as G1
<ESC>Ps***	Activate character set as G2
<ESC>+*Ps*	Activate character set as G3
<ESC>-*Ps*	Activate character set as G1
<ESC>.*Ps*	Activate character set as G2
<ESC>/*Ps*	Activate character set as G3

The following example activates the ASCII character set as G0:

<ESC>(B

The following example activates the ASCII character set as G0, the Supplemental characters as G1, the Line Draw character set as G2, and the Technical character set as G3:

<ESC>(B<ESC>)<<ESC>*0<ESC>+>

Using GL and GR Tables

Once you have activated the character sets you need, you must "map" the contents of the sets into either the GL or GR table. When you map a character set into the GL table, you must send the hex values in the GL column of the character set table to print the characters. When you map a character set into the GR table, you must send the hex values in the GR column of the character set table to print the characters.

Use the following escape sequences to map the activated character sets to the GL and GR tables:

<SI>	Maps the character set activated as G0 into the GL table.
<SO>	Maps the character set activated as G1 into the GL table.
<ESC>~	Maps the character set activated as G1 into the GR table.
<ESC>n	Maps the character set activated as G2 into the GL table.
<ESC>}	Maps the character set activated as G2 into the GR table.
<ESC>o	Maps the character set activated as G3 into the GL table.
<ESC>|	Maps the character set activated as G3 into the GR table.
<ESC>N	Maps the character set activated as G2 into the GL table for one character only.
<ESC>O	Maps the character set activated as G3 into the GL table for one character only.

The following example uses the escape sequences in the first line to activate the ASCII character set as G0 and the Supplemental characters set as G2. The escape sequences in the second line map the ASCII character set into the GL table to print the characters "The price of the item is" and then map the Supplemental character set into the GL table **for one character** to print the cent character (hex 22 is the double quotes character).

<ESC>(B<ESC>+<

<SI>The price of the item is 59<ESC>N"

The printed output would appear as follows:

The price of the item is 59¢

In the following example, the French character set is activated as G1 and mapped into the GL table:

<ESC>)R<SO>Jos{ is from Cura\ao

The printed output would appear as follows:

José is from Curaçao

GL and GR Tables

The following seventeen tables contain the GL and GR codes for the character sets supplied with your LN03 Plus emulation in your QMS printer.

Each character in each set is assigned two hex values. One hex value (7-bit) designates the character in the "GL" (graphics left) table. The other hex value (8-bit) designates the character in the "GR" (graphics right) table. By using the techniques explained previously in this appendix, you can quickly call up either the GL or GR table to print a special character or characters.

ASCII Character Set (Ps=B)

Character	GL	GR
!	21	A1
"	22	A2
#	23	A3
$	24	A4
%	25	A5
&	26	A6
'	27	A7
(	28	A8
)	29	A9
*	2A	AA
+	2B	AB
,	2C	AC
-	2D	AD
.	2E	AE
/	2F	AF
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
:	3A	BA
;	3B	BB
<	3C	BC
=	3D	BD
>	3E	BE
?	3F	BF

Character	GL	GR
@	40	C0
A	41	C1
B	42	C2
C	43	C3
D	44	C4
E	45	C5
F	46	C6
G	47	C7
H	48	C8
I	49	C9
J	4A	CA
K	4B	CB
L	4C	CC
M	4D	CD
N	4E	CE
O	4F	CF
P	50	D0
Q	51	D1
R	52	D2
S	53	D3
T	54	D4
U	55	D5
V	56	D6
W	57	D7
X	58	D8
Y	59	D9
Z	5A	DA
[	5B	DB
\	5C	DC
]	5D	DD
^	5E	DE
_	5F	DF

Character	GL	GR
`	60	E0
a	61	E1
b	62	E2
c	63	E3
d	64	E4
e	65	E5
f	66	E6
g	67	E7
h	68	E8
i	69	E9
j	6A	EA
k	6B	EB
l	6C	EC
m	6D	ED
n	6E	EE
o	6F	EF
p	70	F0
q	71	F1
r	72	F2
s	73	F3
t	74	F4
u	75	F5
v	76	F6
w	77	F7
x	78	F8
y	79	F9
z	7A	FA
{	7B	FB
|	7C	FC
}	7D	FD
~	7E	FE

Supplemental Character Set (Ps=<)

Character	GL	GR
¡	21	A1
¢	22	A2
£	23	A3
	24	A4
¥	25	A5
	26	A6
§	27	A7
¤	28	A8
©	29	A9
ª	2A	AA
«	2B	AB
	2C	AC
	2D	AD
	2E	AE
	2F	AF
°	30	B0
±	31	B1
²	32	B2
³	33	B3
	34	B4
µ	35	B5
¶	36	B6
·	37	B7
	38	B8
¹	39	B9
º	3A	BA
»	3B	BB
¼	3C	BC
½	3D	BD
	3E	BE
¿	3F	BF

Character	GL	GR
À	40	C0
Á	41	C1
Â	42	C2
Ã	43	C3
Ä	44	C4
Å	45	C5
Æ	46	C6
Ç	47	C7
È	48	C8
É	49	C9
Ê	4A	CA
Ë	4B	CB
Ì	4C	CC
Í	4D	CD
Î	4E	CE
Ï	4F	CF
	50	D0
Ñ	51	D1
Ò	52	D2
Ó	53	D3
Ô	54	D4
Õ	55	D5
Ö	56	D6
Œ	57	D7
Ø	58	D8
Ù	59	D9
Ú	5A	DA
Û	5B	DB
Ü	5C	DC
Ÿ	5D	DD
	5E	DE
ß	5F	DF

Character	GL	GR
à	60	E0
á	61	E1
â	62	E2
ã	63	E3
ä	64	E4
å	65	E5
æ	66	E6
ç	67	E7
è	68	E8
é	69	E9
ê	6A	EA
ë	6B	EB
ì	6C	EC
í	6D	ED
î	6E	EE
ï	6F	EF
	70	F0
ñ	71	F1
ò	72	F2
ó	73	F3
ô	74	F4
õ	75	F5
ö	76	F6
œ	77	F7
ø	78	F8
ù	79	F9
ú	7A	FA
û	7B	FB
ü	7C	FC
ÿ	7D	FD
	7E	FE

Technical Character Set (Ps=>)

Character	GL	GR
√	21	A1
⌠	22	A2
─	23	A3
⌡	24	A4
⎮	25	A5
⎛	26	A6
⎜	27	A7
⎝	28	A8
⎞	29	A9
⎠	2A	AA
⎡	2B	AB
⎢	2C	AC
⎣	2D	AD
⎤	2E	AE
⎥	2F	AF
⎦	30	B0
⎧	31	B1
⎨	32	B2
⎩	33	B3
⎫	34	B4
⎬	35	B5
⎭	36	B6
⎪	37	B7
	38	B8
	39	B9
	3A	BA
	3B	BB
≤	3C	BC
≠	3D	BD
≥	3E	BE
∫	3F	BF

Character	GL	GR
∴	40	C0
∝	41	C1
∞	42	C2
÷	43	C3
Δ	44	C4
∇	45	C5
Φ	46	C6
Γ	47	C7
~	48	C8
≃	49	C9
Θ	4A	CA
×	4B	CB
Λ	4C	CC
⇔	4D	CD
⇒	4E	CE
≡	4F	CF
Π	50	D0
Ψ	51	D1
	52	D2
Σ	53	D3
	54	D4
	55	D5
√	56	D6
Ω	57	D7
Ξ	58	D8
ϒ	59	D9
⊂	5A	DA
⊃	5B	DB
∩	5C	DC
∪	5D	DD
∧	5E	DE
∨	5F	DF

Character	GL	GR
¬	60	E0
α	61	E1
β	62	E2
χ	63	E3
δ	64	E4
ε	65	E5
ϕ	66	E6
γ	67	E7
η	68	E8
$\imath$	69	E9
θ	6A	EA
κ	6B	EB
λ	6C	EC
	6D	ED
ν	6E	EE
∂	6F	EF
π	70	F0
ψ	71	F1
ρ	72	F2
σ	73	F3
τ	74	F4
	75	F5
f	76	F6
ω	77	F7
ξ	78	F8
υ	79	F9
ζ	7A	FA
←	7B	FB
↑	7C	FC
→	7D	FD
↓	7E	FE

Line Draw Character Set (Ps=0)

Character	GL	GR
!	21	A1
"	22	A2
#	23	A3
$	24	A4
%	25	A5
&	26	A6
’	27	A7
(	28	A8
)	29	A9
*	2A	AA
+	2B	AB
,	2C	AC
-	2D	AD
.	2E	AE
/	2F	AF
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
:	3A	BA
;	3B	BB
<	3C	BC
=	3D	BD
>	3E	BE
?	3F	BF

Character	GL	GR
@	40	C0
A	41	C1
B	42	C2
C	43	C3
D	44	C4
E	45	C5
F	46	C6
G	47	C7
H	48	C8
I	49	C9
J	4A	CA
K	4B	CB
L	4C	CC
M	4D	CD
N	4E	CE
O	4F	CF
P	50	D0
Q	51	D1
R	52	D2
S	53	D3
T	54	D4
U	55	D5
V	56	D6
W	57	D7
X	58	D8
Y	59	D9
Z	5A	DA
[	5B	DB
\	5C	DC
]	5D	DD
^	5E	DE
	5F	DF

Character	GL	GR
♦	60	E0
▒	61	E1
$^{H}_{T}$	62	E2
$^{F}_{F}$	63	E3
$^{C}_{R}$	64	E4
$^{L}_{F}$	65	E5
°	66	E6
±	67	E7
$^{N}_{L}$	68	E8
$^{V}_{T}$	69	E9
┘	6A	EA
┐	6B	EB
┌	6C	EC
└	6D	ED
┼	6E	EE
⎺	6F	EF
─	70	F0
⎻	71	F1
⎼	72	F2
⎽	73	F3
├	74	F4
┤	75	F5
┴	76	F6
┬	77	F7
│	78	F8
≤	79	F9
≥	7A	FA
π	7B	FB
≠	7C	FC
£	7D	FD
·	7E	FE

United Kingdom Character Set (Ps=A)

Character	GL	GR
!	21	A1
"	22	A2
£	23	A3
$	24	A4
%	25	A5
&	26	A6
’	27	A7
(	28	A8
)	29	A9
*	2A	AA
+	2B	AB
,	2C	AC
-	2D	AD
.	2E	AE
/	2F	AF
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
:	3A	BA
;	3B	BB
<	3C	BC
=	3D	BD
>	3E	BE
?	3F	BF

Character	GL	GR
@	40	C0
A	41	C1
B	42	C2
C	43	C3
D	44	C4
E	45	C5
F	46	C6
G	47	C7
H	48	C8
I	49	C9
J	4A	CA
K	4B	CB
L	4C	CC
M	4D	CD
N	4E	CE
O	4F	CF
P	50	D0
Q	51	D1
R	52	D2
S	53	D3
T	54	D4
U	55	D5
V	56	D6
W	57	D7
X	58	D8
Y	59	D9
Z	5A	DA
[	5B	DB
\	5C	DC
]	5D	DD
^	5E	DE
_	5F	DF

Character	GL	GR
‘	60	E0
a	61	E1
b	62	E2
c	63	E3
d	64	E4
e	65	E5
f	66	E6
g	67	E7
h	68	E8
i	69	E9
j	6A	EA
k	6B	EB
l	6C	EC
m	6D	ED
n	6E	EE
o	6F	EF
p	70	F0
q	71	F1
r	72	F2
s	73	F3
t	74	F4
u	75	F5
v	76	F6
w	77	F7
x	78	F8
y	79	F9
z	7A	FA
{	7B	FB
|	7C	FC
}	7D	FD
~	7E	FE

Dutch Character Set (Ps=4)

Character	GL	GR
!	21	A1
"	22	A2
£	23	A3
$	24	A4
%	25	A5
&	26	A6
’	27	A7
(	28	A8
)	29	A9
*	2A	AA
+	2B	AB
,	2C	AC
-	2D	AD
.	2E	AE
/	2F	AF
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
:	3A	BA
;	3B	BB
<	3C	BC
=	3D	BD
>	3E	BE
?	3F	BF

Character	GL	GR
¾	40	C0
A	41	C1
B	42	C2
C	43	C3
D	44	C4
E	45	C5
F	46	C6
G	47	C7
H	48	C8
I	49	C9
J	4A	CA
K	4B	CB
L	4C	CC
M	4D	CD
N	4E	CE
O	4F	CF
P	50	D0
Q	51	D1
R	52	D2
S	53	D3
T	54	D4
U	55	D5
V	56	D6
W	57	D7
X	58	D8
Y	59	D9
Z	5A	DA
ij	5B	DB
½	5C	DC
|	5D	DD
^	5E	DE
_	5F	DF

Character	GL	GR
‘	60	E0
a	61	E1
b	62	E2
c	63	E3
d	64	E4
e	65	E5
f	66	E6
g	67	E7
h	68	E8
i	69	E9
j	6A	EA
k	6B	EB
l	6C	EC
m	6D	ED
n	6E	EE
o	6F	EF
p	70	F0
q	71	F1
r	72	F2
s	73	F3
t	74	F4
u	75	F5
v	76	F6
w	77	F7
x	78	F8
y	79	F9
z	7A	FA
¨	7B	FB
f	7C	FC
¼	7D	FD
’	7E	FE

Finnish Character Set (Ps=5)

Character	GL	GR
!	21	A1
"	22	A2
#	23	A3
$	24	A4
%	25	A5
&	26	A6
’	27	A7
(	28	A8
)	29	A9
*	2A	AA
+	2B	AB
,	2C	AC
-	2D	AD
.	2E	AE
/	2F	AF
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
:	3A	BA
;	3B	BB
<	3C	BC
=	3D	BD
>	3E	BE
?	3F	BF

Character	GL	GR
@	40	C0
A	41	C1
B	42	C2
C	43	C3
D	44	C4
E	45	C5
F	46	C6
G	47	C7
H	48	C8
I	49	C9
J	4A	CA
K	4B	CB
L	4C	CC
M	4D	CD
N	4E	CE
O	4F	CF
P	50	D0
Q	51	D1
R	52	D2
S	53	D3
T	54	D4
U	55	D5
V	56	D6
W	57	D7
X	58	D8
Y	59	D9
Z	5A	DA
Ä	5B	DB
Ö	5C	DC
Å	5D	DD
Ü	5E	DE
_	5F	DF

Character	GL	GR
é	60	E0
a	61	E1
b	62	E2
c	63	E3
d	64	E4
e	65	E5
f	66	E6
g	67	E7
h	68	E8
i	69	E9
j	6A	EA
k	6B	EB
l	6C	EC
m	6D	ED
n	6E	EE
o	6F	EF
p	70	F0
q	71	F1
r	72	F2
s	73	F3
t	74	F4
u	75	F5
v	76	F6
w	77	F7
x	78	F8
y	79	F9
z	7A	FA
ä	7B	FB
ö	7C	FC
å	7D	FD
ü	7E	FE

French Character Set (Ps=R)

Character	GL	GR
!	21	A1
"	22	A2
£	23	A3
$	24	A4
%	25	A5
&	26	A6
’	27	A7
(	28	A8
)	29	A9
*	2A	AA
+	2B	AB
,	2C	AC
-	2D	AD
.	2E	AE
/	2F	AF
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
:	3A	BA
;	3B	BB
<	3C	BC
=	3D	BD
>	3E	BE
?	3F	BF

Character	GL	GR
à	40	C0
A	41	C1
B	42	C2
C	43	C3
D	44	C4
E	45	C5
F	46	C6
G	47	C7
H	48	C8
I	49	C9
J	4A	CA
K	4B	CB
L	4C	CC
M	4D	CD
N	4E	CE
O	4F	CF
P	50	D0
Q	51	D1
R	52	D2
S	53	D3
T	54	D4
U	55	D5
V	56	D6
W	57	D7
X	58	D8
Y	59	D9
Z	5A	DA
°	5B	DB
Ç	5C	DC
§	5D	DD
^	5E	DE
_	5F	DF

Character	GL	GR
‘	60	E0
a	61	E1
b	62	E2
c	63	E3
d	64	E4
e	65	E5
f	66	E6
g	67	E7
h	68	E8
i	69	E9
j	6A	EA
k	6B	EB
l	6C	EC
m	6D	ED
n	6E	EE
o	6F	EF
p	70	F0
q	71	F1
r	72	F2
s	73	F3
t	74	F4
u	75	F5
v	76	F6
w	77	F7
x	78	F8
y	79	F9
z	7A	FA
é	7B	FB
ù	7C	FC
è	7D	FD
¨	7E	FE

French Canadian Character Set (Ps=9)

Character	GL	GR
!	21	A1
"	22	A2
#	23	A3
$	24	A4
%	25	A5
&	26	A6
’	27	A7
(	28	A8
)	29	A9
*	2A	AA
+	2B	AB
,	2C	AC
-	2D	AD
.	2E	AE
/	2F	AF
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
:	3A	BA
;	3B	BB
<	3C	BC
=	3D	BD
>	3E	BE
?	3F	BF

Character	GL	GR
à	40	C0
A	41	C1
B	42	C2
C	43	C3
D	44	C4
E	45	C5
F	46	C6
G	47	C7
H	48	C8
I	49	C9
J	4A	CA
K	4B	CB
L	4C	CC
M	4D	CD
N	4E	CE
O	4F	CF
P	50	D0
Q	51	D1
R	52	D2
S	53	D3
T	54	D4
U	55	D5
V	56	D6
W	57	D7
X	58	D8
Y	59	D9
Z	5A	DA
â	5B	DB
ç	5C	DC
ê	5D	DD
î	5E	DE
_	5F	DF

Character	GL	GR
ô	60	E0
a	61	E1
b	62	E2
c	63	E3
d	64	E4
e	65	E5
f	66	E6
g	67	E7
h	68	E8
i	69	E9
j	6A	EA
k	6B	EB
l	6C	EC
m	6D	ED
n	6E	EE
o	6F	EF
p	70	F0
q	71	F1
r	72	F2
s	73	F3
t	74	F4
u	75	F5
v	76	F6
w	77	F7
x	78	F8
y	79	F9
z	7A	FA
é	7B	FB
ù	7C	FC
è	7D	FD
û	7E	FE

German Character Set (Ps=K)

Character	GL	GR
!	21	A1
"	22	A2
#	23	A3
$	24	A4
%	25	A5
&	26	A6
’	27	A7
(	28	A8
)	29	A9
*	2A	AA
+	2B	AB
,	2C	AC
-	2D	AD
.	2E	AE
/	2F	AF
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
:	3A	BA
;	3B	BB
<	3C	BC
=	3D	BD
>	3E	BE
?	3F	BF

Character	GL	GR
§	40	C0
A	41	C1
B	42	C2
C	43	C3
D	44	C4
E	45	C5
F	46	C6
G	47	C7
H	48	C8
I	49	C9
J	4A	CA
K	4B	CB
L	4C	CC
M	4D	CD
N	4E	CE
O	4F	CF
P	50	D0
Q	51	D1
R	52	D2
S	53	D3
T	54	D4
U	55	D5
V	56	D6
W	57	D7
X	58	D8
Y	59	D9
Z	5A	DA
Ä	5B	DB
Ö	5C	DC
Ü	5D	DD
^	5E	DE
_	5F	DF

Character	GL	GR
‘	60	E0
a	61	E1
b	62	E2
c	63	E3
d	64	E4
e	65	E5
f	66	E6
g	67	E7
h	68	E8
i	69	E9
j	6A	EA
k	6B	EB
l	6C	EC
m	6D	ED
n	6E	EE
o	6F	EF
p	70	F0
q	71	F1
r	72	F2
s	73	F3
t	74	F4
u	75	F5
v	76	F6
w	77	F7
x	78	F8
y	79	F9
z	7A	FA
ä	7B	FB
ö	7C	FC
ü	7D	FD
ß	7E	FE

Italian Character Set (Ps=Y)

Character	GL	GR
!	21	A1
"	22	A2
£	23	A3
$	24	A4
%	25	A5
&	26	A6
’	27	A7
(	28	A8
)	29	A9
*	2A	AA
+	2B	AB
,	2C	AC
-	2D	AD
.	2E	AE
/	2F	AF
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
:	3A	BA
;	3B	BB
<	3C	BC
=	3D	BD
>	3E	BE
?	3F	BF

Character	GL	GR
§	40	C0
A	41	C1
B	42	C2
C	43	C3
D	44	C4
E	45	C5
F	46	C6
G	47	C7
H	48	C8
I	49	C9
J	4A	CA
K	4B	CB
L	4C	CC
M	4D	CD
N	4E	CE
O	4F	CF
P	50	D0
Q	51	D1
R	52	D2
S	53	D3
T	54	D4
U	55	D5
V	56	D6
W	57	D7
X	58	D8
Y	59	D9
Z	5A	DA
°	5B	DB
ç	5C	DC
é	5D	DD
^	5E	DE
_	5F	DF

Character	GL	GR
ù	60	E0
a	61	E1
b	62	E2
c	63	E3
d	64	E4
e	65	E5
f	66	E6
g	67	E7
h	68	E8
i	69	E9
j	6A	EA
k	6B	EB
l	6C	EC
m	6D	ED
n	6E	EE
o	6F	EF
p	70	F0
q	71	F1
r	72	F2
s	73	F3
t	74	F4
u	75	F5
v	76	F6
w	77	F7
x	78	F8
y	79	F9
z	7A	FA
à	7B	FB
ò	7C	FC
è	7D	FD
ì	7E	FE

JIS Roman Character Set (Ps=J)

Character	GL	GR
!	21	A1
"	22	A2
#	23	A3
$	24	A4
%	25	A5
&	26	A6
’	27	A7
(	28	A8
)	29	A9
*	2A	AA
+	2B	AB
,	2C	AC
-	2D	AD
.	2E	AE
/	2F	AF
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
:	3A	BA
;	3B	BB
<	3C	BC
=	3D	BD
>	3E	BE
?	3F	BF

Character	GL	GR
@	40	C0
A	41	C1
B	42	C2
C	43	C3
D	44	C4
E	45	C5
F	46	C6
G	47	C7
H	48	C8
I	49	C9
J	4A	CA
K	4B	CB
L	4C	CC
M	4D	CD
N	4E	CE
O	4F	CF
P	50	D0
Q	51	D1
R	52	D2
S	53	D3
T	54	D4
U	55	D5
V	56	D6
W	57	D7
X	58	D8
Y	59	D9
Z	5A	DA
[	5B	DB
¥	5C	DC
]	5D	DD
^	5E	DE
_	5F	DF

Character	GL	GR
‘	60	E0
a	61	E1
b	62	E2
c	63	E3
d	64	E4
e	65	E5
f	66	E6
g	67	E7
h	68	E8
i	69	E9
j	6A	EA
k	6B	EB
l	6C	EC
m	6D	ED
n	6E	EE
o	6F	EF
p	70	F0
q	71	F1
r	72	F2
s	73	F3
t	74	F4
u	75	F5
v	76	F6
w	77	F7
x	78	F8
y	79	F9
z	7A	FA
{	7B	FB
|	7C	FC
}	7D	FD
~	7E	FE

Norwegian/Danish Character Set (Ps=6)

Character	GL	GR
!	21	A1
"	22	A2
#	23	A3
$	24	A4
%	25	A5
&	26	A6
'	27	A7
(	28	A8
)	29	A9
*	2A	AA
+	2B	AB
,	2C	AC
-	2D	AD
.	2E	AE
/	2F	AF
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
:	3A	BA
;	3B	BB
<	3C	BC
=	3D	BD
>	3E	BE
?	3F	BF

Character	GL	GR
Ä	40	C0
A	41	C1
B	42	C2
C	43	C3
D	44	C4
E	45	C5
F	46	C6
G	47	C7
H	48	C8
I	49	C9
J	4A	CA
K	4B	CB
L	4C	CC
M	4D	CD
N	4E	CE
O	4F	CF
P	50	D0
Q	51	D1
R	52	D2
S	53	D3
T	54	D4
U	55	D5
V	56	D6
W	57	D7
X	58	D8
Y	59	D9
Z	5A	DA
Æ	5B	DB
Ø	5C	DC
Å	5D	DD
Ü	5E	DE
_	5F	DF

Character	GL	GR
ä	60	E0
a	61	E1
b	62	E2
c	63	E3
d	64	E4
e	65	E5
f	66	E6
g	67	E7
h	68	E8
i	69	E9
j	6A	EA
k	6B	EB
l	6C	EC
m	6D	ED
n	6E	EE
o	6F	EF
p	70	F0
q	71	F1
r	72	F2
s	73	F3
t	74	F4
u	75	F5
v	76	F6
w	77	F7
x	78	F8
y	79	F9
z	7A	FA
æ	7B	FB
ø	7C	FC
å	7D	FD
ü	7E	FE

Spanish Character Set (Ps=Z)

Character	GL	GR
!	21	A1
"	22	A2
£	23	A3
$	24	A4
%	25	A5
&	26	A6
’	27	A7
(	28	A8
)	29	A9
*	2A	AA
+	2B	AB
,	2C	AC
-	2D	AD
.	2E	AE
/	2F	AF
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
:	3A	BA
;	3B	BB
<	3C	BC
=	3D	BD
>	3E	BE
?	3F	BF

Character	GL	GR
§	40	C0
A	41	C1
B	42	C2
C	43	C3
D	44	C4
E	45	C5
F	46	C6
G	47	C7
H	48	C8
I	49	C9
J	4A	CA
K	4B	CB
L	4C	CC
M	4D	CD
N	4E	CE
O	4F	CF
P	50	D0
Q	51	D1
R	52	D2
S	53	D3
T	54	D4
U	55	D5
V	56	D6
W	57	D7
X	58	D8
Y	59	D9
Z	5A	DA
¡	5B	DB
Ñ	5C	DC
¿	5D	DD
^	5E	DE
_	5F	DF

Character	GL	GR
‘	60	E0
a	61	E1
b	62	E2
c	63	E3
d	64	E4
e	65	E5
f	66	E6
g	67	E7
h	68	E8
i	69	E9
j	6A	EA
k	6B	EB
l	6C	EC
m	6D	ED
n	6E	EE
o	6F	EF
p	70	F0
q	71	F1
r	72	F2
s	73	F3
t	74	F4
u	75	F5
v	76	F6
w	77	F7
x	78	F8
y	79	F9
z	7A	FA
°	7B	FB
ñ	7C	FC
ç	7D	FD
~	7E	FE

Swedish Character Set (Ps=7)

Character	GL	GR
!	21	A1
"	22	A2
#	23	A3
$	24	A4
%	25	A5
&	26	A6
’	27	A7
(	28	A8
)	29	A9
*	2A	AA
+	2B	AB
,	2C	AC
-	2D	AD
.	2E	AE
/	2F	AF
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
:	3A	BA
;	3B	BB
<	3C	BC
=	3D	BD
>	3E	BE
?	3F	BF

Character	GL	GR
É	40	C0
A	41	C1
B	42	C2
C	43	C3
D	44	C4
E	45	C5
F	46	C6
G	47	C7
H	48	C8
I	49	C9
J	4A	CA
K	4B	CB
L	4C	CC
M	4D	CD
N	4E	CE
O	4F	CF
P	50	D0
Q	51	D1
R	52	D2
S	53	D3
T	54	D4
U	55	D5
V	56	D6
W	57	D7
X	58	D8
Y	59	D9
Z	5A	DA
Ä	5B	DB
Ö	5C	DC
Å	5D	DD
Ü	5E	DE
_	5F	DF

Character	GL	GR
é	60	E0
a	61	E1
b	62	E2
c	63	E3
d	64	E4
e	65	E5
f	66	E6
g	67	E7
h	68	E8
i	69	E9
j	6A	EA
k	6B	EB
l	6C	EC
m	6D	ED
n	6E	EE
o	6F	EF
p	70	F0
q	71	F1
r	72	F2
s	73	F3
t	74	F4
u	75	F5
v	76	F6
w	77	F7
x	78	F8
y	79	F9
z	7A	FA
ä	7B	FB
ö	7C	FC
å	7D	FD
ü	7E	FE

Swiss Character Set (Ps==)

Character	GL	GR
!	21	A1
"	22	A2
ù	23	A3
$	24	A4
%	25	A5
&	26	A6
’	27	A7
(	28	A8
)	29	A9
*	2A	AA
+	2B	AB
,	2C	AC
-	2D	AD
.	2E	AE
/	2F	AF
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
:	3A	BA
;	3B	BB
<	3C	BC
=	3D	BD
>	3E	BE
?	3F	BF

Character	GL	GR
à	40	C0
A	41	C1
B	42	C2
C	43	C3
D	44	C4
E	45	C5
F	46	C6
G	47	C7
H	48	C8
I	49	C9
J	4A	CA
K	4B	CB
L	4C	CC
M	4D	CD
N	4E	CE
O	4F	CF
P	50	D0
Q	51	D1
R	52	D2
S	53	D3
T	54	D4
U	55	D5
V	56	D6
W	57	D7
X	58	D8
Y	59	D9
Z	5A	DA
é	5B	DB
ç	5C	DC
ê	5D	DD
î	5E	DE
è	5F	DF

Character	GL	GR
ô	60	E0
a	61	E1
b	62	E2
c	63	E3
d	64	E4
e	65	E5
f	66	E6
g	67	E7
h	68	E8
i	69	E9
j	6A	EA
k	6B	EB
l	6C	EC
m	6D	ED
n	6E	EE
o	6F	EF
p	70	F0
q	71	F1
r	72	F2
s	73	F3
t	74	F4
u	75	F5
v	76	F6
w	77	F7
x	78	F8
y	79	F9
z	7A	FA
ä	7B	FB
ö	7C	FC
ü	7D	FD
û	7E	FE

ISO Norwegian/Danish Character Set (Ps= ´)

Character	GL	GR
!	21	A1
"	22	A2
#	23	A3
$	24	A4
%	25	A5
&	26	A6
’	27	A7
(	28	A8
)	29	A9
*	2A	AA
+	2B	AB
,	2C	AC
-	2D	AD
.	2E	AE
/	2F	AF
0	30	B0
1	31	B1
2	32	B2
3	33	B3
4	34	B4
5	35	B5
6	36	B6
7	37	B7
8	38	B8
9	39	B9
:	3A	BA
;	3B	BB
<	3C	BC
=	3D	BD
>	3E	BE
?	3F	BF

Character	GL	GR
@	40	C0
A	41	C1
B	42	C2
C	43	C3
D	44	C4
E	45	C5
F	46	C6
G	47	C7
H	48	C8
I	49	C9
J	4A	CA
K	4B	CB
L	4C	CC
M	4D	CD
N	4E	CE
O	4F	CF
P	50	D0
Q	51	D1
R	52	D2
S	53	D3
T	54	D4
U	55	D5
V	56	D6
W	57	D7
X	58	D8
Y	59	D9
Z	5A	DA
Æ	5B	DB
Ø	5C	DC
Å	5D	DD
^	5E	DE
_	5F	DF

Character	GL	GR
‘	60	E0
a	61	E1
b	62	E2
c	63	E3
d	64	E4
e	65	E5
f	66	E6
g	67	E7
h	68	E8
i	69	E9
j	6A	EA
k	6B	EB
l	6C	EC
m	6D	ED
n	6E	EE
o	6F	EF
p	70	F0
q	71	F1
r	72	F2
s	73	F3
t	74	F4
u	75	F5
v	76	F6
w	77	F7
x	78	F8
y	79	F9
z	7A	FA
æ	7B	FB
ø	7C	FC
å	7D	FD
~	7E	FE

❖

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